The Influence of Gender on the Adaptive Capacity of Swedish reindeer herding communities

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ABSTRACT

In Sweden, the indigenous Sami have exclusive rights to reindeer husbandry, which continues to provide for a minority of Sami in economically and culturally significant ways. However, the Sami have faced longstanding challenges including marginalization within Swedish society, competing interests from multiple industries, a diminishing land base and environmental changes impacting the herds. Meanwhile, gender relations within Sami communities have changed since the mid-19th century as a result of Swedish policies and other factors. These ecological and social changes have impacted the capacity of Sami communities to adapt to dynamic environmental conditions.

While researchers have focused attention on the contribution of "adaptive capacity" (AC) to the resilience of local communities, there is relatively little attention given to Sami populations in Scandinavia. Furthermore, studies regarding AC at the community level generally consider communities as homogenous entities, with little attention paid to how gender relations affect the AC of communities. Therefore, the purpose of this thesis is to address this gap and to inform gender-sensitive policy and practice in resource-based communities.

My study developed a framework for AC that is sensitive to the lifestyle of reindeer herders in Sweden. Data were collected from 81 questionnaires, 9 interviews and other relevant documents, for each of the 51 reindeer herding districts in Sweden. From these sources, I traced contributions of Sami women and men while also exploring changes in AC over time.

The results of the study show that the contribution of cultural and economic capitals to AC is strong among the Sami while the contribution of institutional and natural capitals is weaker. |Both men and women have contributed to their AC and the transformation of their communities, each making unique contributions. The results suggest that herders are proactive in directing the transformation of their society towards one that embraces contemporary technology and opportunities, while maintaining values that support a longstanding cultural tradition. These findings suggest that isolating gendered inputs to adaptation may help create more specific targets for increasing capacity while augmenting their overall effectiveness and efficiency.

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1. INTRODUCTION: Indigenous Resource Management under Conditions of Uncertainty and the Sami People

Indigenous peoples may face uncertainty when it comes to continuing a traditional livelihood in the context of an ever-evolving world (Fishlin et al., 2007). This uncertainty is particularly pertinent for northern communities, where accelerated changes associated with climate change serve to exacerbate pre-existing environmental, economic and social issues (Lemmen & Warren, 2008; Soloman et al., 2007). Indigenous populations from the circumpolar north are already experiencing climatic shifts that are challenging their ability to carry out subsistence activities that have been a central facet of their culture for thousands of years. This occurrence demands policies that focus not only on decreasing carbon dioxide emissions in the hopes of preventing anthropogenic climate change, but also those targeted at adapting to the changes that are already beginning to occur and are not likely to be prevented (Ford, 2009). The Northern European indigenous peoples, known as the Sami, have become familiar with these sorts of challenges.

In Sweden, the Sami do not have land rights or title; rather, they have exclusive rights to reindeer ownership and husbandry. Reindeer herding is a tradition among the Sami people that predates written record and today provides a means of subsistence and economic participation to the minority of Sami who choose to continue pursuing this way of life (Andersson & Keskitalo, 2012; Fitzmaurice, 2009; Bostedt, 2005). Reindeer herding requires the use of great expanses of the Swedish countryside; the animals participate in a lengthy annual migrations between summer and winter grazing lands. The Swedish Reindeer Husbandry Act of 1971 guarantees the right of Sami people to follow their charges cross-country as they graze, even through private forest areas. Therefore, available grazing area accounts for about 55% of the Swedish landscape (Sandström et al., 2014).

The land available for herding and grazing is organized into sub-areas known as "reindeer villages" or reindeer herding districts, which encompass the summer and winter grazing lands of the Sami reindeer herds living within them (Löf et al., 2012). While many participate in traditional reindeer herding practices that have changed little in centuries, it is also

common to use modern technologies such as snowmobiles for corralling the animals, as well as helicopters and computer technologies for tracking, observation and other purposes (Andersson & Keskitalo, 2012; Bostedt, 2005). The availability of modern methods for rendering the herding process more efficient is complemented by generations of traditional ecological knowledge that the Sami possess as a result of their close relationship with the herding lands. They have acquired the ability to identify the best grazing areas and spot the best plants on which the animals may feed, among other key skills (Inga & Dannell, 2012; Furberg, Evengard & Nilsson, 2011).

Despite the longstanding employment of the Sami as reindeer herders and supportive legislation, the Sami face daily threats to traditional activities. These threats stem from a variety environmental, economic and social challenges that are ever-present in their lives. In particular, while reindeer herding can be considered an economic enterprise, it also exists at different functional levels for reindeer herders themselves; not only as a form of employment, but at a larger scale as a family or community practice. Beyond that, reindeer herding exists as a livelihood that defines the way of life of those who practice it (Figure 1.1). It is steeped in centuries of cultural traditions, experiences and knowledge building. As such, threats to the reindeer herding industry do not only present potential loss of economic participation; they risk destroying a way of life, with associated knowledge and cultural traditions. Hence, reindeer husbandry is conceived broadly, to include the economic enterprise of herding as well as the practices and traditions that characterize it as a livelihood.

The thesis is based on the premise that changes to the circumstances of reindeer husbandry affect Sami men and women differently because they each make specific contributions to the business, the community-based practice, and the livelihood associated with reindeer husbandry. Conversely, Sami men and women contribute specific skills, knowledge, and traditions to support the adaptive capacity of their communities. While some research has focused on adaptive capacity in northern communities, relatively little focuses on Sami reindeer herders. Consequently, the impacts of changing social, economic and environmental conditions on Sami communities and livelihoods are just beginning to be revealed (Lof, 2013; Brannlund & Axelsson, 2011; and Tyler et al., 2007, for example), while the contributions of men and women in reindeer herding communities to adapt to these changes have yet to be explored.

Hence, the present study develops a framework to assess the adaptive capacity of a reindeer herding community[1] and then applies the framework to identify the relative contributions of men and women to the community's overall adaptive capacity. It is expected that gender will influence some elements of adaptive capacity more than others. As there are so few studies that link gender and adaptive capacity, this research will articulate elements of adaptive capacity for which gender is particularly relevant. The research is situated across several bodies of literature: the environmental, economic and social challenges faced by Sami reindeer herders; assessments of adaptive capacity and gender-based analysis in adaptive capacity; and environmental management more broadly. In chapter 2, each body of literature is reviewed in turn, providing a rationale for the research questions. The research questions and objectives of the study follow. In chapter 3, the methods, study design and data analysis are explained. Chapter 4 presents the results of the study, organized by the six different forms of capital that were assessed in the study. Here, each indicator within each form of capital is discussed, and gender differences described where applicable. Chapter 5 presents an analysis of these results by first assessing adaptive capacity overall and then examining what contributions gender makes in each of these areas. Finally, Chapter 6 provides concluding remarks on the study.

[1] Communities can be defined by geographic territory, by shared interests or obligations, and by attachments or collective association (Reed 2003). For the purposes of this study, a "community" will refer to a social group whose members reside in a specific locality, share a form of governance, and a cultural heritage. Specifically, I will be speaking about the Swedish Sami reindeer herding community as a whole. Though smaller (sub) communities of Sami exist as part of reindeer herding districts with unique characteristics, the study assumes that their similarities are great enough that they can be treated, with care and understanding of their uniqueness, as a whole.

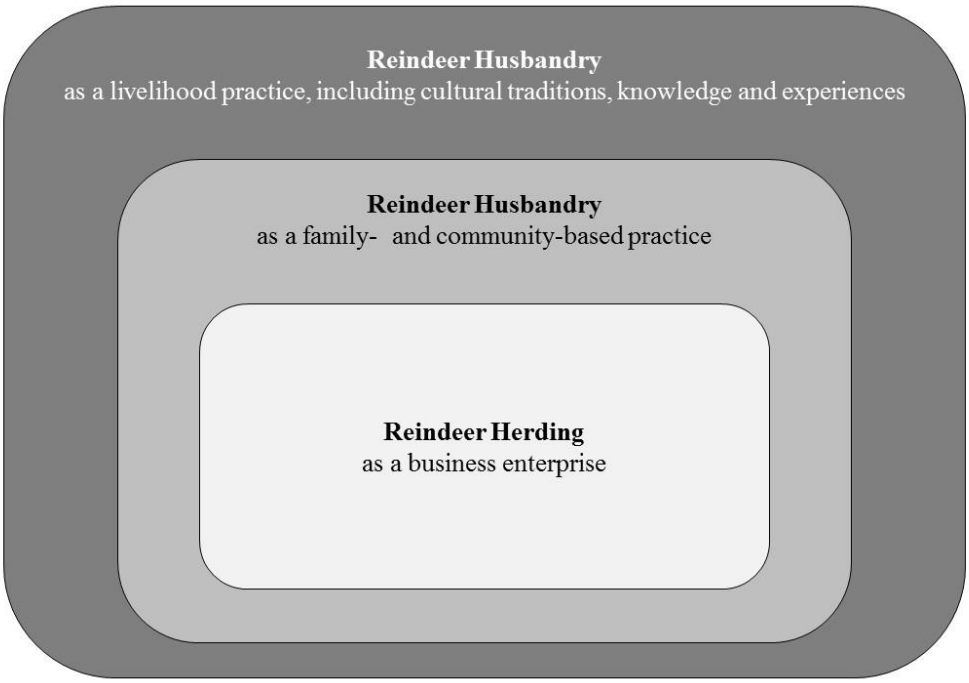

Figure 1.1 - Simple Functional Scales within Reindeer Husbandry in Sweden. Reindeer herding as a business enterprise exists within the larger scales of reindeer husbandry as a family and community practice and as a livelihood at larger scales.

2. REVIEW OF LITERATURE

2.1: Challenges Faced by the Sami

The Sami are facing a great deal of change with regard to the social, economic and climatic variables that influence their persistence as a community. Some of these changes take place within a few years, while others take place across the span of generations. Nevertheless, the capacity of Sami people to adapt to these changes will define their ability to maintain their livelihood for the foreseeable future. Environmental changes associated with climate change have the greatest impact on those whose lives are most closely tied to the state of the environment around them. The groups most at risk of facing devastating changes to their way of life are those closest to the poles – where the effects of climate change have been the most acute and exacerbated (Soloman et al., 2007). This phenomenon has not gone unnoticed in Northern Europe, where the success of Sami reindeer herding depends on a certain degree of climatic stability (Bruce, 2012). A study conducted in Norway by Tyler et al. (2007) examined climatic projections to conclude that a warming trend is occurring in that country, and that the trend is expected to impact the seasonal movement of reindeer herds managed by Norwegian Sami pastoralists, as well as the availability of suitable vegetative food. These climatic trends have been confirmed by reindeer herders' observations as well. A study conducted by Riseth et al. (2011) focusing on Finland found that the traditional knowledge and discourse of the Sami agree largely with studies conducted in the area. In these cases, climate researchers and the Sami concluded that warmer temperatures were resulting in more rain events and a hardened snowpack. In Sweden, the Sami have noticed variations in weather and seasons, resulting in changes in movement patterns of the herds, altered breeding cycles and changes in vegetation, among others (Furberg, Evengard & Nilsson, 2011). Knowledge of environmental changes and their impact on the pastoralist way of life has penetrated the entire reindeer herding community: even children fear what the future may hold for their people given the changes observed in the climate they depend upon so dearly (Jonsson Sarri & Alerby, 2012).

While climate change-related environmental variations are currently a prevalent area of research given the pressing nature of its effects, reindeer herders also have experience with

anthropogenic changes to their environment. Primarily between the 1940s and 1960s, nuclear weapons testing contaminated the Scandinavian Peninsula with radiocaesium, two isotopes of which can be harmful to humans in large doses (Forberg, Odsjö & Olsson, 1992; Ahman, 1998). While the radiocaesium levels present at the time were not cause for great concern, the Swedish government began collecting and analyzing samples from reindeer as well as other species of plants and animals during that period and continued to do so well after the nuclear tests had ended (Forberg, Odsjö & Olsson, 1992; Ahman, Ahman & Rydberg, 1990).

In April of 1986, when radiocaesium levels suddenly spiked, the source of the problem was a nuclear reactor explosion in Chernobyl, Ukraine, that took place on the 26th of that month (Ahman, Ahman & Rydberg, 1990). The National Institute of Radiation Protection in Sweden quickly established acceptable limits for radiocaesium in food for human consumption of 300 Bq/Kg, resulting in a rejection of 78% of the reindeer slaughtered that year (Ahman, Ahman & Rydberg, 1990; Bostedt, 1998). The widespread problems associated with radiocaesium levels in reindeer in Sweden brought about a preference shift among consumers to other kinds of meat, causing prices for reindeer meat to drop, further harming an industry that already held only a small fraction of the meat market share, more recently accounting for a mere 0.6% of total meat consumption in the country (Bostedt, 1998).

It was clear that mitigation measures were needed to ensure that the reindeer husbandry industry did not disappear altogether, and a number of strategies were implemented by herders and slaughterhouses to help reduce the radiocaesium levels in reindeer meat at the time of slaughter. The main source of radiocaesium present in reindeer was their diet – particularly in winter when reindeer grazed on lichen, a food source that had absorbed a great deal of radiation (Ahlgren, 2011; Ahman, 1990). For this reason, clean feed was sometimes used for a few weeks or so prior to slaughter (Ahman, Ahman & Rydberg, 1990; Ahman 1990b), and slaughter times were often changed to earlier in the season in order to reduce the amount of lichen consumed by the reindeer. The latter proved to be the most efficient method as it avoided the cost of providing supplementary feed (Ahman, Ahman & Rydberg, 1990).

The Swedish government also stepped in and declared that it would pay for the costs associated with the Chernobyl fallout, including paying back the cost of rejected meat, lower animal body weights, and additional labour to slaughterhouses as well as the cost of reducing radiation levels in reindeer incurred by herders (Ahman, Ahman & Rydberg, 1990). In the

second year after the disaster, it also raised the allowable limits for radiocaesium content in food to 1500 Bq/kg, and only about 29% of reindeer meat was discarded that year (Ahman, Ahman & Rydberg, 1990; Ahman 1999).

Presently, Västerbotten and Jämtland counties must continue to use mitigation strategies for reducing the radiocaesium content in reindeer meat produced in those areas, including both early slaughter and clean feeding (Ahlgren, 2011). From year to year, the consequences of Chernobyl become less burdensome, yet they persist, and further environmental challenges associated with climate change are becoming more prevalent. Still, challenges to traditional Sami pastoralist life are not limited to those that are environmental in nature.

Secondly, Sami people, particularly reindeer herders, face a variety of economic challenges associated with their livelihood. For a minority of the Sami in Sweden, reindeer husbandry remains a central means of employment and cultural fulfillment. Recent changes to Sweden's forestry industry, however, have resulted in the need for some Sami to seek gainful employment elsewhere. Many have left their traditional livelihood altogether, while some balance herding with other means of employment, including agriculture, the harvest of other game species, and employment as guides for those interested in touring remote areas of the countryside (Jonsson, Sarri & Alerby, 2012). Those that remain solely herders by trade are declining in numbers and at present, within the Swedish population of about 9.6 million people, the Sami number approximately 20,000 with reindeer herding Sami accounting for approximately 2,500 among them (Statistics Sweden, 2014b; Sami Parliament, 2009).

Mechanization of the forestry industry began in the 1950s, resulting in much more extensive timber removal and the use of clearcutting as a strategy for efficient timber harvesting (Fitzmaurice, 2009). Several studies have documented the adverse impact to grazing lands – tree removal leads to a change in snow cover dynamics on the forest floor, making it much more difficult for reindeer to reach vegetation hidden beneath (Roturier & Roué, 2009, Bostedt, 2005; Eriksson et al., 1987). As a result of clearcutting practices, the preparation of soils for reforestation can destroy a great deal of the forest-floor lichens on which reindeer feed (Kivinen et al., 2010; Roturier & Bergsten, 2006). Such problems have led to increasing discussion between Sami and foresters, as well as increasing conflict – the Sami often feel as though their interests are not being acceptably satisfied (Widmark, 2008). Furthermore, the forests of northern Sweden have been divided in to ever-smaller parcels for the sake of management over

the last century, making the process of negotiating herding rights with land managers an arduous and complicated one (Holmgren, Keskitalo & Lidestav, 2010; Sandstrom & Widmark, 2007). Finally, other modern industries create obstacles in the path of the herds: hydroelectric reservoirs, roads, wind farms, tourist resorts and all other forms of development make moving the reindeer herds even more difficult as a result of landscape fragmentation (Furberg, Evengard & Nilsson, 2011). The culmination of these changes is a pastoralist population whose livelihood is in danger, despite its protected status in Swedish law.

Finally, social challenges abound for Sami reindeer herders, particularly when it comes to the protection of a traditional livelihood, which has been hard won. Until the 19th century, the Sami were taxed by the Swedish government, and in return, gained the right to use areas for herding known as "taxation lands," although this right often had to be fought for in court (Josefsson, Bergman & Ostlund, 2010). Aggressive assimilation policies were enacted in the mid-19th century in Nordic countries that undermined any rights they had previously enjoyed. Kuokkanen (2009) argues that assimilation was pursued in the name of social welfare and education, while Kvist (1994), makes a case for its connection to concerns on the part of the Swedish government surrounding the possibility of the Sami beginning to trade with Norway, rather than Sweden. Regardless of the root of the new policies, the result has been many far-reaching social changes to the Sami way of life. Assimilatory policies created a population whose numbers dwindled, whose traditional familial roles have blurred, whose languages are endangered and whose people may face identity crises as a result of marginalization within Swedish society, despite the protected status that has since been granted them by the government (Valijaervi & Wilbur, 2012; Bals et al., 2010; Kuokkanen, 2009; Turi et al., 2009; Hansen et al., 2007; Kvist, 1994).

Discrimination toward the Sami peoples has continued in Scandinavia even as assimilatory policies have been abandoned in favour of newer legislation to protect their traditional livelihood: Throughout the 1990s, the question of how the reindeer were impacting the Swedish countryside was a favourite topic amongst local media, despite the multiple land uses in effect. It was believed that the reindeer would eat all the vegetation, thereby ruining the aesthetics of the Swedish mountains – a highly valued aspect of the countryside (Torp, 1999). Furthermore, a lack of cooperation remains between Sami museums that have been established to conserve Sami heritage and other Swedish national museums, and the Swedish government has

so far shown little interest in allowing the Swedish Sami parliament to take a leadership role in conserving its heritage (Mulk, 2009). Even as recently as 2012, a study assessing the health of Swedish Sami youth found that about one-half of respondents had often felt mistreated as a result of their ethnicity. This affected their mental health; those who had experienced discrimination were more likely to experience periods of depression and sadness as well as stress and worry (Omma, Jacobsson & Petersen, 2012).

Sami women, in particular, may have faced the brunt of changes to their traditional livelihood. There is some debate regarding the evolution of gender roles and relations among the Sami. Kuokkanen (2009) argues that prior to interference by Scandinavian governments, men and women were treated with equal privilege and had equal rights with regard to property ownership and inheritance in reindeer herding communities. This is not to say that tasks were divided up equally; rather, women and men specialized in different activities. Specifically, women proved to be exceptionally skilled when it came to establishing bonds with other families and groups and family-oriented tasks, among others (Kuokkanen, 2009). She goes on to state that, in accordance with patriarchal policies enacted by the Swedish government, particularly since 1945, women's roles within Sami communities have been devalued, and property rights have become almost the sole privilege of Sami men. According to Kuokkanen, this has had the effect of reducing women's access to property in the event of their husband's death, divorce and in cases involving inheritance where a male sibling or relative may be favoured – a phenomenon that extends into other resource-based industries, such as farming and forestry (Lidestav, 2010; Kuokkanen, 2009; Amft, 2000; Li & Singlemann, 1998). For the Sami, it has meant that many women have left their traditional lifestyle in search of gainful employment or education elsewhere (Kuokkanen, 2009). On the same topic, a Sami Parliament document detailing its Gender Equality Program (Larsson et al., 2004) discusses at length a thesis by Andrea Amft (2000). Similarly to Kuokkanen, Amft points to policies enacted by the Swedish government that served to marginalize women within Sami culture. More specifically, she points to several pieces of legislation, beginning with the Grazing Act (1886). The language of this legislation and those that came after it, argues Amft, use terminology regarding Sami that is masculine, essentially rendering women's roles invisible with regard to government and legal institutions. She also believes that the use of more masculine language persists in more recent legislation, despite attempts to render them more gender-neutral, including revisions to the Reindeer Husbandry Act

(1971) that were completed in 1993 (Amft, 2000). Further, she points to the myth of Sami women as strong and equal participants in reindeer husbandry. She states that this myth has served to support the marginalization of women within Sami communities. Attempts to speak out about gender inequality within reindeer herding communities interfered with the priority of promoting Sami and reindeer husbandry rights overall, and anyone who did so was thought to have been influenced by greater Swedish society, and therefore not a true Sami (Amft, 2000).

Presently, according to the Swedish Sami Parliament, as much as 85% of active herders are men[2] (Sami Parliament, 2009). The repercussions of the apparent exclusion of women from certain facets of reindeer husbandry are unclear, yet, there is also evidence to suggest that the modernization of reindeer herding has created some opportunities for women to become more involved in fieldwork aspects of the industry. About 10% of reindeer herding villages have begun using GPS[3] collars for tracking reindeer, and as a result, women who would not normally play an active role in the herding process are able to be involved in understanding the movements of the herds from home (Andersson & Keskitalo, 2012).

It is evident, given the body of research on the topic, that dynamic environmental, social and economic factors have a profound impact on reindeer herders' way of life. As such, a greater understanding of the factors that influence their adaptive capacity is crucial, particularly where it concerns the separation of gender rights and roles initiated by Swedish policies, and the lasting affect this may have had on Sami communities across the country.

[2] It is unclear by what definition a person is or is not considered an active reindeer herder for the purposes of the Sami Parliament documents from which this figure was obtained. This notion will be further discussed in Chapter 5.
[3] Global Positioning Systems

2.2: Assessing Adaptive Capacity

Adaptive capacity is a concept born of resilience theory, first introduced to describe the state of ecological systems by C. S. Holling four decades ago, in 1973. He defined resilience as the "persistence of relationships within a system" and the ability of a system to withstand disturbance while continuing to exist in a recognizable state (Holling, 1973, p. 17).

In relation to resilience theory, Gunderson (2000) was one of the first users of the term *adaptive capacity*, and defined it as "system robustness to changes in resilience" (Gunderson, 2000, p. 11), although similar terms and definitions had been explored previously in the social sciences (Bennett, 1976) and the natural sciences (Smit & Wandel, 2006). Since its introduction, the term has been redefined and applied in many different contexts. Folke (2006) argued that adaptive capacity is a strength that increases a system's resilience; that mere "robustness" is a weakness, and that too much of either can lead to system collapse. Systems that have high adaptive capacity can rearrange when exposed to change without substantial sacrifices to their functions (Folke et al., 2005). This view is echoed by other authors, many of whom consider adaptive capacity to be related to vulnerability – the amount of adaptive capacity demonstrated by a system is inversely related to its vulnerability in the face of change (Smit & Wandel, 2006; Brooks, Adger & Kelly, 2005; Smit et al., 2000). Generally speaking, adaptive capacity with regards to socio-ecological systems may be defined as the ability of a system to continually develop and alter itself in the face of change without sacrificing its most important functions, thereby enhancing its resilience (Folke, 2006; Smit & Wandel, 2006; Adger & Vincent, 2005; Armitage, 2005; Folke et al., 2005; Adger, 2000). Community resilience can then be expressed with reference to what assets are available to be mobilized in the process of adaptation (Cassidy & Barnes, 2012; Klenk et al., 2011;Gilbert & McLeman, 2010; Mendis-Millard & Reed, 2007, Dolan and Walker, 2006; Yohe & Tol, 2002).

The assets available that comprise community resilience can then be expressed as forms of capital, as is common in studies assessing adaptive capacity (e.g., Wall & Marzall, 2007; Cutter et al., 2010; Cutter et al., 2008; Klenk et al., 2011). While each study varies in the forms of capital assessed and their indicators, there are some forms of capital that are commonly used for these purposes. *Social capital* refers to the assets derived from community relationships and each person's contribution to these (Portes, 1998; Coleman, 1988). *Human* capital refers to

changes undergone by individuals that provide them with new assets and functional levels (Coleman, 1988). *Cultural* capital can take the form of embodied traits or skills, material assets or education (Bourdieu, 1979). *Institutional* capital can be defined as institutions and governance structures that reduce ambiguity and are designed to contribute to the adaptive capacity of a system (Platje, 2008). *Natural* capital denotes the supply of available materials and information existing in the natural environment (Costanza et al., 1997). Finally, *economic* capital is usually expressed in terms of monetary income and assets with a monetary value (Anheier et al., 1995).

A number of works have been completed that assess adaptive capacity at the community level. A commonality among them is that a great number are provoked by changes related to climate change, including Nelson et al. (2008) who conducted a study to establish the vulnerability of rural communities to adaptive capacity, as well as Twomlow et al. (2008) and Brown et al. (2010), who conducted studies addressing the adaptive capacity of communities in Africa. Similarly to the present one, a number of other studies have been conducted in northern communities, including Pearce et al (2010), who explored vulnerabilities related to climate change in an Inuit community in the Northwest Territories and Wall & Marzall (2006) who developed a framework for assessing adaptive capacity and applied it to an undisclosed rural community in central Canada.

While many studies are grounded in climate variation issues, they often result in the conclusion that adaptive capacity to climate change is hindered by broad social and economic issues that exist in the study area. For example, Eakin, Lerner & Murtinho (2010) found that the lack of adaptive capacity associated with flooding in their peri-urban study area in Mexico was exacerbated by poor institutional response to runaway urbanization. The aforementioned study by Brown et al. (2010), which sought to discover ways for enhancing community adaptive capacity in the Congo, cited issues regarding poor linkage between government institutions as a major hindrance to adaptive capacity. Finally, in a study concerning the adaptive capacity of a flood-prone community in Puerto Rico, the authors found that while residents perceived flooding to be a risk to their well-being, residents were much more concerned with prevailing socio-economic conditions and the threat those conditions posed to the health of their community (Lopez-Marrero & Yarnal, 2010).

In the context of the present study, evidence of other social, political and/or economic barriers superseding problems associated with environmental change have also been documented

in cases involving the Sami peoples of Europe. For example, Tyler et al. (2007), examined the most likely climate change scenarios and their impact on the adaptive capacity of the Sami of Norway. They acknowledged that non-climatic barriers to adaptation associated with the complex economic and socio-political environment within which the Sami must maneuver are likely to overshadow climatic influences in the future. Similarly, a study conducted in Northern Sweden found that the negative impacts associated with climate change would have a lesser role in testing the adaptive capacity of the community than social and economic changes also taking place, including resource use conflicts between the Sami and the forestry industry (Keskitalo, 2008).

2.3: Gender in Adaptive Capacity and Environmental Management

Despite the wealth of studies that has been conducted assessing adaptive capacity, little effort has been made to undertake gender sensitive analyses of adaptive capacity. There are examples in which community adaptive capacity has been analyzed and gender-related issues have presented as barriers. For example, Riche et al. (2009), found that due to the marginalization of women within Ethiopian communities, women did not have the same degree of mobility as men, and were therefore more susceptible to climate change-related events, such as flooding. Shaffer (2012), who considered the use of indigenous knowledge in Mozambique as a tool for building adaptive capacity, had a similar finding. She noted that women were often disadvantaged when it came to the distribution of indigenous knowledge as a result of the paternalistic nature of their society and were therefore disadvantaged when it came to adapting to climatic changes. Klenk et al. (2011), who performed rapid adaptive capacity assessments on Canadian model forest communities, noted differences between the men and women in their sample. Particularly, they found that women had greater access than men to human and cultural capital assets, while men had better access to economic and social capital assets. Further, they highlighted the fact that access to indigenous knowledge can aid in community adaptation. Nevertheless, there is doubt as to whether these examples can be easily compared to the context of indigenous Swedish reindeer herders, and none of these studies addressed how increased gender equality may contribute to the adaptive capacity of each community as a whole. It is particularly important to learn if gender is still a relevant concern in Scandinavian countries,

where gender equality has been given high priority in public policy (Swedish Ministry of Rural Affairs, 2004; Toresson, 2006).

Indeed, there is little research regarding gender in the broader context of environmental management in post-industrial contexts, as noted by Reed and Christie (2009). In particular, the evidence suggesting that gender plays a role in the contribution of Sami women and men as members of their community (Andersson & Keskitalo, 2012; Kuokkanen, 2009) further supports the need for research.

2.6: Statement of Problem, Research Questions and Objectives

More than a decade ago, Gunderson and Holling (2002), argued that there was a lack of research regarding how human populations and societies respond to periods of change. Since then, a number of studies have been conducted with regard to adaptive capacity and its ability to enhance community resilience in the face of change (e.g. Shaffer, 2012; Brown et al., 2010; Eakin, Lerner & Murtinho, 2010; Lopez-Marrero & Yarnal, 2010; Nelson et al., 2009; Riche et al., 2009; Paton et al., 2008; Twomlow et al., 2008). Much of this research has been conducted surrounding aboriginal and northern peoples (e.g. Pearce et al., 2010; Keskitalo, 2008; Wall & Marzall, 2006; Tyler et al., 2007). Still, there has been limited research involving the Sami of Northern Sweden and the adaptive capacity of their communities. Given the pressing uncertainties they face in relation to their changing social milieu, their means and ease of economic participation, and pressures associated with climate change. As such, knowledge stands to be gained with regard to the ability of such communities to adapt to these pressures, the strategies already in use and lessons to be learned for practice in communities elsewhere where similarities exist.

In particular, studies about adaptive capacity at the community level generally regard communities as homogenous entities, with little attention paid to the differing contributions of males and females to the adaptive capacity of their community as a whole. For example, a study conducted by Brannlund & Axelsson (2011), used Swedish historical data in the form of reports and letters by government officials and testimonials from within the Sami community to assess vulnerability and adaptation of the Sami during the 19th and 20th centuries. The researchers compared historical adaptation barriers to those faced by Sami communities in the present day.

The study identified the main barriers as colonial, economic (due to land-use changes), and environmental in nature much like the proposed research. It also described community features that enhanced adaptive capacity. However, it made no attempt to assess adaptive capacity from a gendered perspective. Any mention of Sami women as separate entities from their male community counterparts was completely omitted. This is not an isolated occurrence and presents a flawed approach given evidence suggesting that Sami women and men, though equal in privilege, historically specialized in different tasks (Kuokkanen, 2009).

In light of this significant omission in the literature, there exists a fundamental need for research that addresses the changing context of Sami life in Sweden with particular sensitivity to the roles men and women play in relation to the adaptive capacity of the community overall. This need is supported by the fact that there is little understanding of the consequences of the recent and common exclusion of women from herding activities, and the ways in which communities may have suffered from the loss of their skills and intellectual potential. This research, then, will address these gaps and to provide new insights and recommendations regarding the pursuit of traditional livelihoods in a changing global, national and regional context.

2.6.1: Research Questions:

To better understand the gendered dimensions of adaptive capacity in Swedish reindeer herding communities, I address the following research questions:

1. What is the current status of adaptive capacity in Swedish reindeer herding communities and how has it changed in the last few decades?
2. How do men and women contribute to the adaptive capacity of Swedish reindeer herding communities overall?
3. What changes can be made to policy and practice in order to increase adaptive capacity of reindeer herding communities? How might a gender-sensitive approach increase the success of these measures?

2.6.2: Objectives:

- Determine key economic, social, and environmental changes affecting reindeer herders in Sweden
- Develop an analytical framework of adaptive capacity that can be used to assess gender differences
- Use the framework to analyze the contributions of men and women in relation to the adaptive capacity of their community
- Identify gender-sensitive options (if necessary) for strengthening the adaptive capacity of reindeer herding communities.

3. METHODS, STUDY DESIGN AND ANALYSIS

3.1: Framework for Assessing Adaptive Capacity

Following the example of Wall & Marzall (2007), Cutter et al. (2010), Cutter et al. (2008), and Klenk et al. (2011), among others, the framework is organized into categories defined by types of capital: social capital, human capital, cultural capital, natural capital, institutional capital, and economic capital. These categories provide a basis for organizing the multiple indicators at play.

Social capital has been the focus of a great deal of literature, but for the purposes of this study, it refers to the assets derived from community relationships and social norms, each person's contribution to these and the benefit that can be derived from them by community members (Portes, 1998; Putnam, 1995; Coleman, 1988). Social capital has sometimes been broken down into bonding and bridging forms. "Bonding" social capital refers to the relationships between family members and other very close relationships including friends and neighbours, while "bridging" social capital refers to more distant relationships, such as those between distant friends and colleagues (Gittell & Vidal, 1998). Further, "linking" social capital may be described as relationships with individuals and institutions beyond a community that may influence nonetheless its ability to mobilize certain assets (Woolcock, 2001). While social capital may appear intangible by definition, it may also lead to the mobilization of tangible assets that is only possible as a result of the existence of relationships between community members (Coleman, 1988). Social capital is inherently difficult to measure and it is not always clear if high social capital is desirable. For example, there may be no clear indicators of bonding. And a community with a very high degree of bonding or bridging may be viewed as closed to ideas or to people who are not part of a small group in position of power (Pelling & High, 2005).

Hence, to provide a measure of the amount and strength of social capital for the present study, a simplified application of the Buckner Scale was chosen. Buckner (1988) suggested that the most important measures of social cohesion relate to the length of time an individual has spent in a community, the amount of contact individuals have with their neighbours and the existence of a common bond with other community members. Buckner endeavoured to create an instrument for measuring social cohesion in geographically-bound neighbourhoods. The

resulting instrument, in the form of a questionnaire, included 40 items meant to test the above characteristics of neighbourhood members. In this study, Buckner variables were simplified and applied, and questionnaire respondents were asked to rate their agreement with several statements according to a 5-point Likert scale (Appendix A).

The Buckner indicators reflect the bonding forms of social capital. Trends in emigration and the number of community events that take place were explored to support this investigation. These may be proxies for bridging forms of social capital. For the purposes of the present study, the age of participants is another important consideration. According to Morrow (2008), a population with an accelerated average age can indicate one that would respond unfavourably to acute changes requiring adaptation, as the elderly tend to have greater reliance on institutions and community members. Nevertheless, it is important to recognize that elders may also possess high amounts of bonding social capital, as a result of the longer period of time they have had to develop relationships with other community members. Further, it is important that some elders are present in reindeer herding communities, for the purposes of teaching and training new generations. As such, several dimensions of age distribution were considered.

Human capital refers to changes undergone by individuals that provide them with new assets and functional levels (Coleman, 1988). Education is a primary indicator of human capital in most studies assessing adaptive capacity (Cutter et al. 2010; Wall & Marzall, 2007; Klenk et al., 2011 and others). Where a community is at risk of facing events that may test its adaptive capacity, education and skills are often necessary to successfully adapt to its changing context (Morrow, 2008). Furthermore, in the context of indigenous communities, a great deal of the skills and narratives that are key in traditional livelihoods are taught to each generation by the previous ones (Ermine & Pittman, 2011). It is for this reason that elders' engagement is an important concern, in conjunction with questions of ancestry that will be raised in the "cultural capital" category of the framework.

Cultural capital can take the form of embodied traits or skills, material assets or education (Bourdieu, 1979). For the purposes of this study, the focus will be regarding embodied traits (such as ancestry) and education (such as language). Ancestry is an important consideration based on the assumption that an individual who has had lower residency time in a Sami community will have had less time and fewer social ties that may aid in the development of a skill set that lends itself to effective participation in traditional activities. Language is another

central concern with regard to cultural capital as a result of its perceived connection to cultural identity in indigenous communities. A study by Kvernmo & Heyerdahl (2004) that looked at the ethnocultural attitudes of Sami youth found that native language had a strong link to cultural identity. Given that there is evidence to suggest that the number of speakers of Sami languages have been decreasing (Valijaervi & Wilbur, 2012), language is an important consideration with regard to adaptive capacity. Furthermore, a high incidence of skill in multiple languages amongst community members may indicate high adaptive capacity: it may point to community members' ability to communicate with a broad range of people and seek employment in multiple fields in order to subsidize income derived from pastoralism.

Institutional capital can be defined as institutions and governance structures that reduce ambiguity and are designed to contribute to the adaptive capacity of a system (Platje, 2008). Political action has been selected as a variable in this regard because according to Morrow (2008) ethnic minorities are often at risk of having diminished political power within the context of a much larger majority population. A lack of participation, indicated for the purposes of this framework by a low proportion of voter turnout in Sami parliament, and lower levels of participation in reindeer herding plans, may express disengagement among the Sami when it comes to Swedish politics. Secondly, the availability of communications services is an important consideration because, besides improving preparedness in emergency situations as suggested by Colten et al. (2008), communications may prove to be key in maintaining communications between family members and family groups participating in reindeer herding practices. Finally, legislation governing reindeer herding practices is considered in the framework due to the fact that while herding is a right among the Sami people, it is not without regulation governing where and how it may be performed. The number of reindeer allowed in each district, the borders of each district and the areas in which reindeer may graze during different times of the year are examples of controls on reindeer husbandry that are largely decided at the government level (Josefsson, Bergman & Ostlund, 2010; Kuokkanen, 2009). These regulations may either support or hinder herding practices (or both), affecting community adaptive capacity.

Natural capital denotes the supply of available materials and information existing in the natural environment (Costanza et al., 1997) and is understandably important to indigenous communities like the Sami whom engage in a traditional, resource-based way of life. As previously mentioned, reindeer herding lands being used by the Sami are facing increased land-

use pressures from multiple industries (Furberg, Evengard & Nilsson, 2011) and noted climatic shifts (Tyler et al., 2007). These shifts have a profound effect on pastoralism, limiting reindeer food supply and changing seasonal movements of the herds (Tyler at al., 2007; Riseth et al., 2001; Furberg, Evengard & Nilsson, 2011), making them important considerations in the adaptive capacity framework.

Economic capital is usually expressed in terms of monetary income and assets with a monetary value (Anheier et al., 1995). Economic capital is key in the creation of resilient communities, as it defines the material resources available in situations requiring adaptation, and is particularly pointed in emergency situations, where preparation measures such as the purchase of insurance prior to an acute event depend highly on one's disposable income (Tierney et al., 2001). With regard to reindeer herding communities, multiple sources of income may indicate a commitment to continuing traditional pastoralist activities, even at times when they are not sufficient as a sole source of income. Market controls on the pricing of reindeer product are an important consideration in understanding the need for multiple sources of income, where they exist. An individual's role within the household and within pastoralism will help to explain who is participating in what parts of reindeer herding, likely clarifying questions around gender roles (although this will be inherent in all other indicators to some degree as well). Finally, the purchase of economic assets in the form of modern technologies that aid in the herding process serves as a further indicator of economic assets in the community.

In order to adequately assess adaptive capacity in the study area, I developed a framework that draws on previous assessments as well as social, economic and climatic challenges that are likely to be present in the context of the study. Additionally, the framework was constructed with the intention of targeting indicators that are likely to demonstrate gendered differentiation in its application for the purposes of the study. The framework does not provide a "yes" or "no" answer regarding adaptive capacity; rather, it allows for the identification of elements of adaptive capacity that support or inhibit capacity, both in the present and, where possible, in the past.

At the outset of the research, a framework for assessing adaptive capacity was created by reviewing relevant literature and consulting with research partners at the University of Saskatchewan and the Swedish University of Agricultural Sciences in Sweden (Table 3.1). This framework was then used as a means of guiding and focusing the research through the processes

of data collection and analysis. As these processes were undertaken, however, the framework was continually reviewed and edited to reflect the availability of data and local sensitivities regarding certain topics.

Table 3.1 – Framework for Assessing Adaptive Capacity

Type of capital	Indicator	Variable	+/- on AC	Justification	Data source*
Social	Age	-% non-elderly adult population, balance among age groups	+/-	Morrow, 2008	Q
	Gender	-Male/female split of community members/ questionnaire respondents	+/-		Q
	Community attachment/ engagement	-Buckner variables (Length of time will spend in community, degree of contact with neighbours, feeling of common bond with neighbours -Trends in mobility rates, community emigration -Number of community events	+ + +	Buckner, 1988	Q
	Equality	-Perception of status within society	+/-		I
Human	Experience and training	-% of seniors involved in training	+	Ermine & Pittman, 2011	Q
	Education levels	-Trends in years of schooling completed -Language proficiency	+	Kulshreshtha et al., 2012	Q
Cultural	Indigenous ancestry	-% population with Sami ancestry/upbringing covered under social capital	+	Filbert & Flynn, 2010; Ermine & Pittman, 2011	Q
	Language	-% of people proficient in Sami language	+	Morrow, 2008	Q
	Cultural activities	-Participation in culturally significant activities	+		Q
Institutional	Political action	-% voter turnout -Use of Reindeer Herding Plans	+	Morrow, 2008	Q
	Communications services	-Availability of local radio/TV/internet	+	Colten et al., 2008	FE
	Legislation	-Legislative awareness	+	Josefsson et	Q,I

	governing herding	-Feelings toward government regulations	+/-	al., 2010; Kuokkanen, 2009;	
Natural	Forest reserve	-# of users per hectare forest within village area -Trends in grain-feeding reindeer -Perceived food availability (reindeer)	- - +	Furberg et al, 2011 Tyler et al., 2007	LD Q
	Seasonal variation	-Prevailing climate science -Perception of climatic changes and their tendency to be positive or negative	+/- +/-	Tyler et al., 2007	LD Q,I
	Predation	-% loss to predation/year	-	Tyler et al., 2007; Riseth et al., 2001; Furberg et al., 2011	Q
Economic	Employment levels and opportunities	-Average # of employment types/year -Market controls on reindeer product pricing -Income -Role within the household -Trends in subsistence	+/- +/- + +/- +	Jonsson et al., 2012	Q LD LD Q Q
	Economic assets	-Trends in equipment use	+/-	Andersson & Keskitalo, 2012	LD

***Data Source Legend:**
LD: Literature and other relevant documents
Q: Questionnaire
I: Interviews
FE: Field Experience

3.2: Study Location

The research followed a case study design, which involves undertaking the research of a phenomenon, or in this case a community, from within its own context using a variety of sources of data (Yin, 2009). It is a popular approach with community-based and adaptive capacity research, as no two communities are entirely the same and therefore require treatment as unique entities between which similarities may later be observed.

I collected data from the Sami reindeer herding districts of Vilhelmina Norra and Vilhelmina Södra, both located in the area of the Vilhelmina Model Forest Management Area, as displayed in Figure 3.1. The Vilhelmina Model Forest comprises about 870 000 ha of boreal forest in northwestern Sweden. It has a relatively small population of about 7500 people but is subject to a variety of land uses, primarily forestry and Sami reindeer husbandry, but also including a growing number of hydroelectric projects, mining and tourism (Svenson et al., 2012). Vilhelmina Södra and Vilhelmina Norra, the Southern and Northern Sami villages, comprise 2 of 51 designated herding areas within Sweden (Löf et al., 2012). In addition to data from the Vilhelmina area, where contact information was available for a majority of resident reindeer herders, I administered questionnaires to the remaining 49 reindeer herding districts. Contact information was available for at least one household in each of the remaining districts, however, not all districts are represented in the sample where lack of interest existed. Therefore, 34 of 51 reindeer herding districts participated overall, with 13 of 81 questionnaires and 6 of 9 interviewees coming from one of the two districts located directly in the management area of Vilhelmina Model Forest.

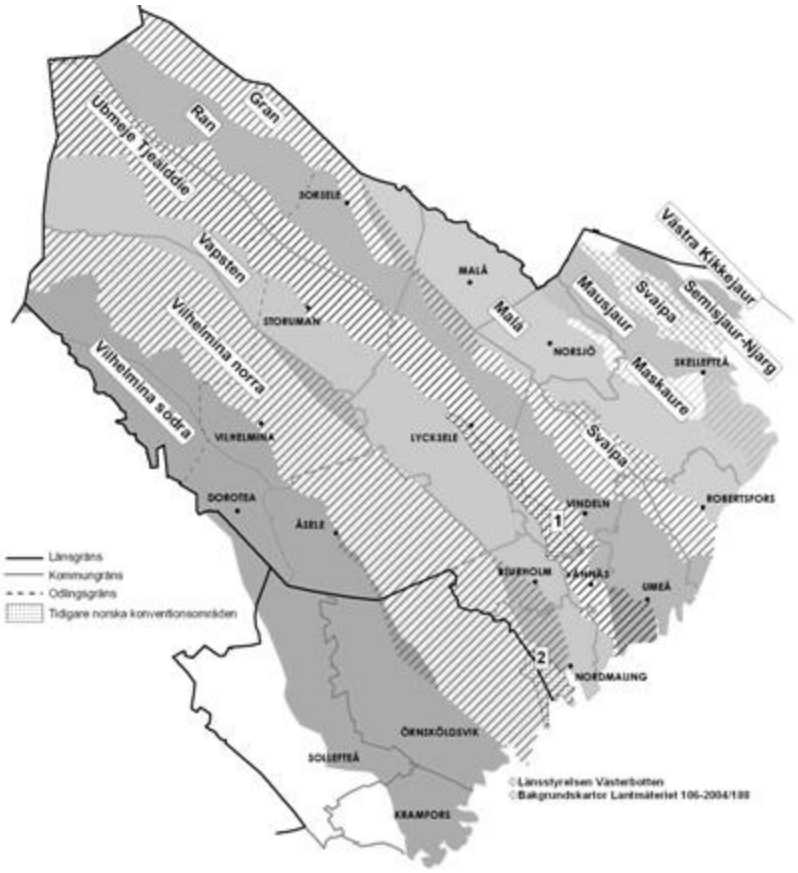

Figure 3.1 - Several reindeer herding districts in Northern Sweden. On the left, we can see Vilhelmina North ("norra") and Vilhelmina South ("sodra"). Toward the centre of the two districts, the town of Vilhelmina is marked, and the solid grey line that denotes the area of Vilhelmina Municipality, which also serves as the border for the Vilhelmina Model Forest Management area.

Source: Vasterbotten County Administration Board, http://www.lansstyrelsen.se/vasterbotten/Sv/naringsliv-och-foreningar/rennaring/Samebyar/Pages/default.aspx

3.3: Data Collection

When assessing adaptive capacity at the community level, interviews and secondary sources are commonly used (Brown et al., 2010; Eakin et al., 2010; Pearce et al., 2010; Keskitalo, 2008; Wall & Marzall, 2006). Both of these strategies were pursued for the purposes of my research. The questionnaire was used as the main method of data collection as a result of its common use in adaptive capacity research, particularly in studies using communities as case

studies. Questionnaires were considered successful in the aforementioned study by Paton et al. 2007, for example, who studied the effect of the 2004 tsunami on coastal communities in Thailand. It was also chosen for the simplicity with which responses may be interpreted, given that I do not speak Swedish or Sami (Appendix A).

Adaptive capacity is relative in nature and is difficult to assign numbers or scores. Therefore, it is often helpful to use a time period in order to compare earlier values with present values for a better indication of positive or negative movement with regard to certain indicators or capitals (See Klenk et al., 2011, for example). To this end, it was decided that 1986 would be an appropriate year to use for the purposes of comparison, given the fact that Swedish reindeer herders experienced the fallout from the nuclear disaster in Chernobyl that same year. As a result of prevailing winds at the time radiocaesium from the disaster was carried to Sweden and later ingested by animals, including reindeer. This resulted in the destruction of almost all that year's reindeer meat, as the radiocaesium content was deemed too high for human consumption (Ahman, Ahman & Rydberg, 1990). In order to understand whether or not significant impacts were still being experienced as a result of the disaster, 1986 was used as a reference year for many questions on the questionnaire and also provided the needed reference period for comparison purposes.

The questionnaire was translated into Swedish with the help of colleagues at the Swedish University of Agricultural Sciences and then translated back to English to ensure agreement with the original text, in accordance with the methods of performing cross-cultural research suggested by Brislin, Lonner & Thorndike (1973). Once a satisfactory translation was established, distribution of the questionnaire began via mail (2 per household, to be filled out by adults) using the contact information of resident reindeer herders in each district provided by staff at Vilhelmina Model Forest. While it is possible that not all adults in a given household were reindeer herders, a letter written by Hanna Vestman, a colleague from the Swedish University of agricultural sciences, made it clear that we were interested in hearing from reindeer herders. All contacts available were sent questionnaires for a total of 535 questionnaires, sent to 270 households.

Overall, questionnaires were returned from 34/51 reindeer herding districts, and an additional group of questionnaires (4 total) were returned with their numbers removed, presumably because participants did not want to be identified, and therefore cannot be grouped

by district. In total, 81 questionnaires were collected from 63 households, and household response rate was 23.3%. Hanna Vestman, a colleague at the Swedish University of Agricultural Sciences who was also using data obtained using the questionnaire, explored the geographic distribution of responses by county and type of reindeer herding district[4]. She found little difference between the response rates of herding districts in Sweden based on their distribution from north to south: Jämtland/Dalarna, Norrbotten and Västerbotten counties contributed 29, 28 and 25% of questionnaire respondents, respectively. When considering the type of reindeer herding districts from which the questionnaires were returned, there was a marked difference between the three types: Concession districts accounted for 38%, forest districts for 35% and mountain districts for only 24%. Anecdotally, the lower response rate for mountain reindeer herding districts may be a result of the larger geographic area of these districts. Reindeer herders may spend more time away from their primary residents in these cases, and therefore would not have received the questionnaires in a timely manner. Figure 3.2 displays the geographic distribution of questionnaire respondents.

[4] There are three groupings by which reindeer herding districts may be classified in Sweden: mountain districts, forest districts and concession districts. Mountain districts encompass the largest land areas, concentrated to the north-western mountainous portions of Sweden. Forest districts are smaller, forested areas in the north-eastern portion of Sweden, where herders are able to live in more stationary villages. Concession villages, concentrated in the most north-eastern portion of Sweden, are areas in which reindeer may be owned by non-Sami land owners but are managed by Sami (Sametinget, 2014).

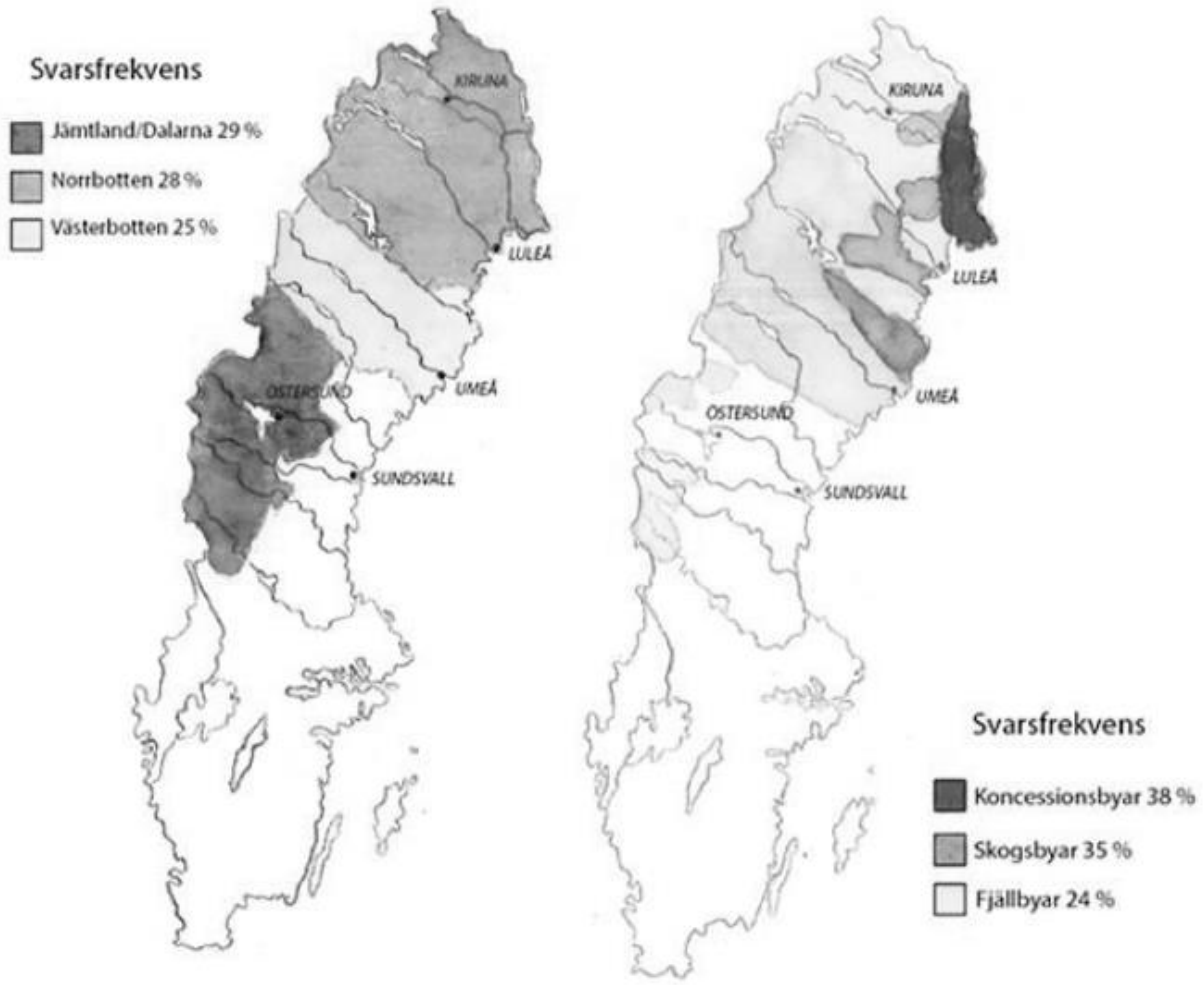

Figure 3.2 - The Geographic Distribution of Questionnaire Respondents. Left: by county. Right: by type of reindeer herding district: concession districts (Koncessionsbyar) forest districts (Skogsbyar) and mountain districts (Fjällbyar). Illustration by H. Vestman, available at http://shop.skogsstyrelsen.se/sv/publikationer/rapporter/renbruksplan-fran-tanke-till-verklighet.html

Of respondents, 59 were men and 22 were women, and 9 agreed to follow-up interviews. The subsequent interviews were done in four parts: one focus group with 5 individuals (2 men and 3 women), one double interview (two men), and two single interviews, each with women. Initially, the interviews were intended to be conducted individually, however, due to scheduling difficulties, this was not possible. Questions of a more personal nature were thus removed from interviews (See interview guide in Appendix B). Interviews were conducted in Vilhelmina, at the Model Forest Office in English and Swedish. A colleague from the Swedish University of Agricultural Sciences helped with translation, where needed. Interviews were recorded and transcripts were created with the help of the same colleague to translate Swedish parts of the

recordings. Secondary qualitative data were also used to supplement those collected using the questionnaire and interviews. Secondary sources consisted primarily of income data collected from the Vilhelmina Tax Office, as well as brochures, posters and articles available through the Vilhelmina Model Forest staff.

3.4: Analysis

Each set of two questionnaires mailed out included return postage to the Vilhelmina Model Forest Office. As they were returned, the data they contained were inputted into a database using IBM SPSS Statistics Version 22 software. The limited questionnaire responses that included qualitative, short-answer responses were translated to English and later analyzed for common responses and major themes using Nvivo 10. Due to the small number of interviews, these responses were manually analyzed for key themes and responses, and were used primarily to explain trends found elsewhere in the data.

Referring to the previously established framework for assessing adaptive capacity in this context, each variable was examined to understand its impact, whether positive or negative. To this end, frequencies were the most important statistical measures, as expressed by the percentage of responses to each question. Variables were also analyzed by age group where possible to ascertain the change over time in indicators of adaptive capacity. Finally, male and female respondents' answers were compared to each other in order to understand the contributions of each gender to adaptive capacity of their community overall. To this end, primarily two statistical tests were used. Independent T-Tests were used to analyze relationships between two independent categorical variables, such as gender and education level. In cases where a continuous variable was present, relationships were analyzed using a one-way analysis of variance (ANOVA). In either case, a p-value was obtained to determine the statistical significance of the relationship between the variables being considered, using the 95^{th} percentile as an indicator of a strong significant relationship ($p = <0.05$).

4. **RESULTS: Indicators of Adaptive Capacity in Reindeer Herding Communities**

The following chapter will describe the results of the study pertaining to the data collected from 81 questionnaires, nine interviews and additional secondary materials. It is organized into the six forms of capital considered in the framework and the indicators that were subsequently used to analyze each form of capital. The data for each indicator are considered in aggregate, then age group and gendered differences in the data are explained where these were found to be statistically significant.

4.1: Social Capital

4.1.1: Age

The sample demonstrated relative balance among age groups up to 64 years of age, with proportions lying between 17.3% and 29.9%. Only 6.3% of participants identified as being 65 years of age or over (Table 4.1). While there is variation in age-group proportions between men and women (Appendix C), a Pearson Chi-Square test revealed that the difference between men and women was not statistically significant (0.052).

Table 4.1: Age distribution of questionnaire respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-34	21	25.9	26.3	26.3
	35-44	19	23.5	23.8	50.0
	45-54	21	25.9	26.3	76.3
	55-64	14	17.3	17.5	93.8
	65+	5	6.2	6.3	100.0
	Total	80	98.8	100.0	
Missing	System	1	1.2		
Total		81	100.0		

4.1.2: Gender

Male respondents to the questionnaire portion of the study accounted for 72.8% (n=59), while women accounted for the remaining 27.2% (n=22). While women represent the minority, it is worth mentioning that according to Sami Parliament statistics, 85% of active reindeer herders are men (Sami Parliament, 2009) and a higher than expected proportion of women were therefore included in the study.

4.1.3: Community Attachment and Engagement

When measuring the strength of social capital for the purposes of the study, a simplified application of the Buckner Scale was used by considering measures of social cohesion including length of time an individual has spent in a community, the amount of contact they have with their neighbours and the existence of a common bond with other community members. With regard to time spent in the community, questionnaire respondents were asked if they had always been a reindeer herder, to which 80% responded yes. Next, respondents were asked to indicate the amount of agreement they had with two statements. To the first, "I intend to continue living and working in my current Sameby (reindeer herding district) for a long time," 70.5% of respondents answered, "Strongly agree," with an additional 14.1% responding, "Agree". The following statement read, "I have regular contact with the other members of my Sameby," to which 76.9% answered, "Strongly agree," and an additional 15.4% responded, "Agree" (Appendix D). There was no significant difference in response with regard to gender for any of the three Buckner variables.

4.1.4: Equality

The use of questions involving Likert scales continued for the purposes of assessing reindeer herders' feelings surrounding equality between genders, both within and without the reindeer herding industry. With regard to the statement, "I have equal access to reindeer herding employment as members of the opposite sex," 63.6% responded, "Strongly agree" (Women= 60.0%, Men = 64.9%), and an additional 14.3% answered, "Agree". The second statement was, "I have equal access to other forms of employment as members of the opposite sex," and also received an affirmative response. Overall, 52.1% responded, "Strongly agree," and 19.2% said,

"Agree" (Appendix E). The Pearson Chi-Square test determined that there was no statistically significant link between gender and the results for either of these statements; however, it is interesting to note that women had a more negative response to the former statement than men and a more affirmative response to the latter.

In response to the aforementioned statistic from the Sami Parliament stating that 85% of active reindeer herders are men, respondents were asked who they anticipated would carry on their reindeer herding business after they retired to ascertain whether the trend might continue in the future. Only 24.7% of respondents (n=20) had both sons and daughters. Of these, 45% stated that both their sons and daughters would inherit their business, 30% said only their son(s) would inherit, and 5% said only their daughter(s) (Appendix F). No statistically significant difference was found between the responses of men and women. When asked about this in interviews, two individuals (one man and one women in the focus group) agreed that women often raise children within reindeer herding communities, making it difficult for them to inherit the business. Other explanations included that perhaps men are more willing to do the hard work, that women are responsible for other things, women have a greater tendency to move away, and that this is the tradition within reindeer herding communities (each cited by one interviewee). One male interviewee (aged 45-54) stated, in part,

> Today, it doesn't matter – the parents give both daughters and sons the same possibilities. So they, of course – but often it's a hard work, it's easier for boys to take part of the work. You see I have a son, he's 12 years old, he is sitting on the motorbike now for, I think his third year. So it comes to [be] a man's work but they (women and girls) can [come] with us when we are working with the reindeer. But then her real hobbies is horses and dolls and that…

As a measure of how reindeer herders felt equality played out on a national scale, interviewees were asked, "Do you feel that your culture and way of life are respected within greater Swedish society? Why or why not?" Among interviewees, the response to this question was unanimously "No." The most common explanations for why were, 1) that there is a general lack of understanding and education about what reindeer herders are (5/9 interviewees), and 2) from the perspective of the Swedish government, industry and the population in general, reindeer herders represent a source of competition for land and resources (5/9 interviewees). A few of these issues were raised during the focus group-style interview, from which an excerpt can be found in Box 4.1 below.

Box 4.1: Excerpt from focus group (August 14, 2013)
NOTE: "KK" is a young man, age 18-34, "Ka" is a young woman, age 18-34, and "A-C" is a woman, age 35-44.

KK: I feel like it's, they have no respect for our life. They just say, well, we want to put up uh, wind crafts. And we say no, you can't do that, because then we have no food for the reindeer. They will give us money, but money can't fix it. Because the money doesn't do that we have more land. It's – it's nothing. And they're like, yea well it does.
Ka: I think they actually don't know much about our lifestyle or how we work with the reindeers and how the Sami people have lived, how our culture is. I think this is the biggest problem. They don't know…
A-C: […] they learn about native people.
Ka: Yes, because they learn about it in school, but they – I have been in school all my life and I haven't…
Interviewer: […] First Nations in North America? You guys learn about that here?
KK: Yea. […] In school, I went to school in a small village. We had on one day, it was like a "Sami Day". We learned about this. But in bigger schools, they don't have it.
[…]
Ka: But now, it's the Sami administration municipality – they work more to learn all the grades in school about Sami people. So I think it will be better in the future. I hope.
Interviewer: So it has gotten better in the recent past at least.
Ka: They have started to learn and to educate the children and I think in … (inaudible) and the school more than before. So, I think it help a little better understanding in the future about Sami people and how the reindeer people live.
KK: But some of the Swedish people they, they, they think that we live in […] teepees! They don't know that we live indoors. They think that we do things like… they don't know that we can drive a car or watch TV in a house, they think that we're all living in the forest in a teepee. That's their life. They don't know that we actually know the outside world.
Interviewer: Well, if it makes you feel better, a lot of Americans think that Canadians live in igloos.
A-C: I actually got that question about it. "Ah, do you live in teepees all year? Do you shoot ice bears?"
KK: Ice bears in Sweden. They're so stupid!
[…]
A-C: I think really this society see that the Sami culture as a threat…
Interviewer: A threat?
A-C: Yea, about the resources. Natural resources – because they want to keep track of us. They want to uh…
Interviewer: Keep an eye on you? Make sure you're not getting out of hand?
A-C: Yes, yes. Because they don't really want to give that. And I think it's a power thing, because when you compare us to wind power, waterpower, we don't give the society money in the same way. And that's why they prefer to have wind power and waterpower in the Sami country. They will always put… be sure that they can handle it in some way.

4.2: Human Capital

4.2.1: Experience and training

Education is a primary indicator of human capital in most studies assessing adaptive capacity (Cutter et al. 2010; Wall & Marzall, 2007; Klenk et al., 2011 and others). Where a community is at risk of facing events that may test its adaptive capacity, education and skills are often necessary to successfully adapt to its changing context (Morrow, 2008). Furthermore, in the context of indigenous communities, a great deal of the skills and narratives that are key in traditional livelihoods are taught to each generation by the previous ones (Ermine & Pittman, 2011). For this reason, it was determined that, for the purposes of this study, a determinant of strong human capital would be the percentage of seniors involved in training, as well as education levels.

Overall, 33 respondents noted involvement in teaching and training others. Of these, 8 were women and 25 were men. The age group with the highest proportion involved in teaching and training was 35-44 years of age, with 52.6% of respondents in this category noting involvement. Still, a significant proportion of respondents in the 55-64 and 65+ age categories noted participating in teaching a training, with 42.9% and 40.0% respectively (Appendix G). Chi-Square tests found no significant statistical links between participation in teaching and gender or age.

Questionnaire respondents were also asked to identify the highest level of education they had completed. The overall results show that 71.6% of respondents have a high school education or lower. However, a cross tabulation analysis shows that 72.7% of women in the sample continued their education after secondary school, but only 11.9% of men persisted (Table 4.2). Additionally, Chi-Square tests indicate that education levels are significantly related to gender (Sig. =0.000). In addition, a cross-tabulation analysis reveals a statistically significant relationship between age and education (Pearson's sig. 0.035). Figure 4.2 demonstrates the inverse relationship that exists between age and education amongst respondents in the sample, while Appendix H provides the exact proportions in a cross-tabulation.

Table 4.2: Cross-tabulation results between gender and education levels

			What is the highest level of education you have completed?					
			Elementary	Secondary	Courses in uni/college	Bachelor	Master	Total
Gender	Male	Count	18	34	5	1	1	59
		% within gender	30.5	57.6	8.5	1.7	1.7	100.0
	Female	Count	1	5	11	3	2	22
		% within gender	4.5	22.7	50.0	13.6	9.1	100.0
Total		Count	19	39	16	4	3	81
		%	23.5	48.1	19.8	4.9	3.7	100.0

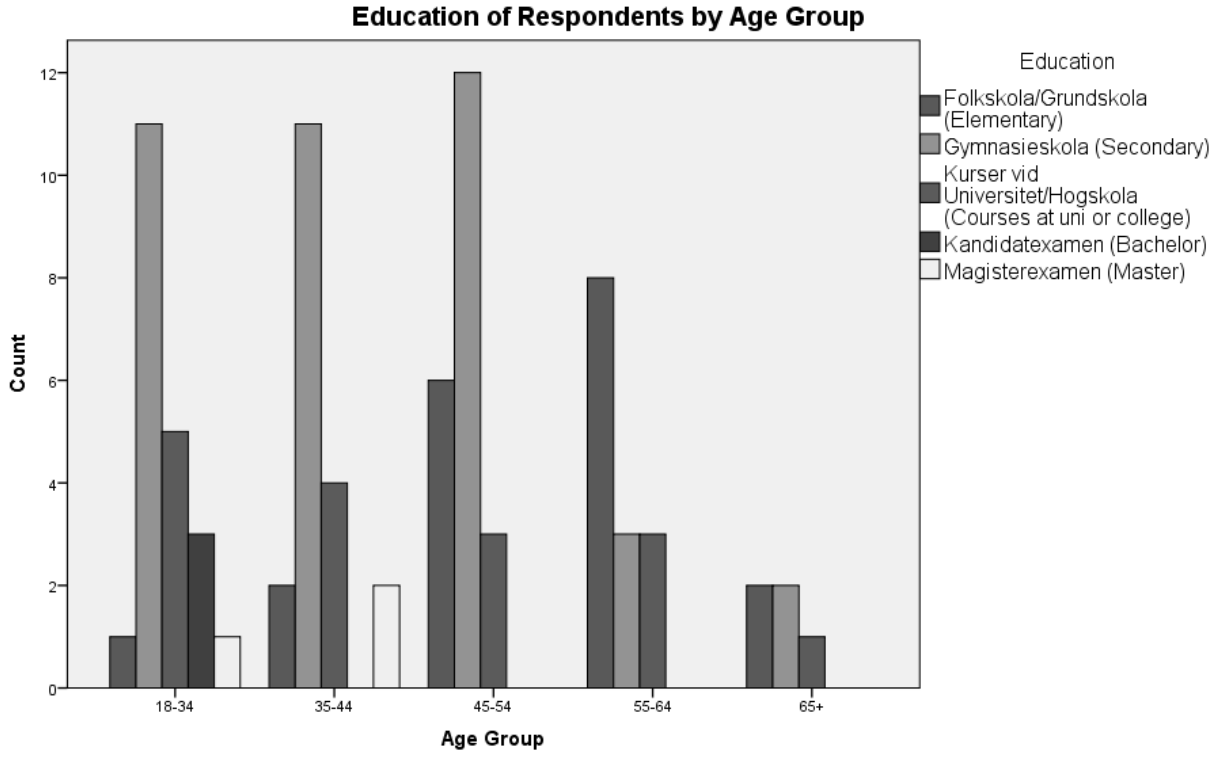

Figure 4.2 - Education of Respondents by Age Group. The inverse relationship that is demonstrated on the graph between age and education level denotes a change toward higher education levels in herders over the last few decades.

Finally, respondents were asked to identify whether or not they perceived any barriers to attaining a higher level of education. Overall, 23.5% (n=19) of respondents answered this question in the affirmative. A cross-tabulation analysis revealed that men in the sample were approximately twice as likely to perceive barriers to higher education (Men = 27.1%, women = 13.6%) (Appendix I). Of the respondents who found barriers to attaining a higher level of education, 8 (42.1%) cited their age as the problem in an open-ended question on the questionnaire. However, the Pearson Chi-Square identified no statistically significant link between gender and perception of education barriers, or age and perception of education barriers (p= .203, .280 respectively)

4.2.2: Languages

As a further test of human capital, questionnaire respondents were asked to indicate their proficiency in Swedish, any Sami Language and English by checking off boxes that indicated if they could read in a language, speak a language, and/or write in a language. Additional spaces were provided as well for a clear idea of the total number of languages spoken by each participant. Respondents were given a point for each measure of proficiency, giving them an overall score that could be compared to other respondents. For example, if a respondent could speak, read and write in Swedish, Sami and English, they were given a score of 9. The mean score of the sample overall was 7.53, with a minimum score of 2 and maximum of 14 (Std. Dev. 2.637). Among men, the mean proficiency score was 7.02, and among women, 8.91 (Appendix J). An independent-samples t-test was performed in order to test the hypothesis that language proficiency is dependent on gender, and in this case determine if women have higher language proficiency than men in a statistically significant way. This resulted in a sig. (2-tailed) value of 0.003, indicating that the results are statistically significant (Table 4.3).

Table 4.3: Independent Samples Test between gender and language proficiency

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference
Language proficiency score	Equal variances assumed	.919	.341	-3.014	79	.003	-1.892
	Equal variances not assumed			-3.244	43.918	.002	-1.892

In order to compare means of language proficiency between age groups, a one-way Analysis of Variance (ANOVA) was performed. The means demonstrated an inverse relationship between age and language proficiency (Table 4.4), and the ANOVA confirmed that the difference between means was statistically significant (p=0.022) (Table 4.5).

Table 4.4: Language proficiency by age group

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
18-34	21	9.00	2.702	.590	7.77	10.23	3	14
35-44	19	6.95	1.870	.429	6.05	7.85	4	12
45-54	21	7.05	2.439	.532	5.94	8.16	3	13
55-64	14	7.29	3.024	.808	5.54	9.03	3	12
65+	5	5.60	2.302	1.030	2.74	8.46	2	8
Total	80	7.49	2.624	.293	6.90	8.07	2	14

Table 4.5: ANOVA between language proficiency and age groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	76.031	4	19.008	3.046	.022
Within Groups	467.957	75	6.239		
Total	543.988	79			

4.3: Cultural Capital

4.3.1: Indigenous Ancestry

Ancestry is an important consideration based on the assumption that an individual who has had lower residency time in a Sami community will have had less time and fewer social ties that may aid in the development of a skill set that lends itself to effective participation in traditional activities. Above, under Human Capital, it was noted that 80% of respondents identified as always being a reindeer herder. This number relates directly to their ancestry and the number of years spent living in the community, as the reindeer herding lifestyle and skills are ingrained within children almost from birth.

4.3.2: Sami Languages

Language is another central concern with regard to cultural capital as a result of its perceived connection to cultural identity in indigenous communities. A study by Kvernmo & Heyerdahl (2004) that examined ethnocultural attitudes of Sami youth found that native language had a strong link to cultural identity. Given that there is evidence to suggest that the number of speakers of Sami languages have been decreasing (Valijaervi & Wilbur, 2012), language is an important consideration with regard to adaptive capacity.

As aforementioned under Human Capital, questionnaire respondents were asked to indicate whether or not they could read, speak and/or write in any Sami language. With regards to reading, 46.9% of the sample cited proficiency. These proportions varied between men and women: 40.7% of men and 63.6% of women. However, a Pearson's chi-square analysis determined that this difference was not statistically significant ($p=0.066$). When it came to speaking, 59.3% of the sample indicated proficiency; 55.9% of men and 68.2% of women. This value was also not statistically significant ($p=0.318$). Finally, with regard to writing in Sami, a total of 32.1% cited proficiency; 25.4% of men and 50% of women. The Pearson chi-square determined that this **was** statistically significant ($p=0.035$). The results of these cross-tabulations are summarized in Table 4.6.

Table 4.6: Cross-tabulation between gender and Sami language proficiency (reading, writing and speaking)

			"I read Sami"		
			No	Yes	Total
What is your gender?	Male	Count	35	24	59
		% within What is your gender?	59.3	40.7	100.0
	Female	Count	8	14	22
		% within What is your gender?	36.4	63.6	100.0
Total		Count	43	38	81
		% within What is your gender?	53.1	46.9	100.0

			"I speak Sami"		
			No	Yes	Total
What is your gender?	Male	Count	26	33	59
		% within What is your gender?	44.1	55.9	100.0
	Female	Count	7	15	22
		% within What is your gender?	31.8	68.2	100.0
Total		Count	33	48	81
		% within What is your gender?	40.7	59.3	100.0

			"I write in Sami"		
			No	Yes	Total
What is your gender?	Male	Count	44	15	59
		% within What is your gender?	74.6	25.4	100.0
	Female	Count	11	11	22
		% within What is your gender?	50.0	50.0	100.0
Total		Count	55	26	81
		% within What is your gender?	67.9	32.1	100.0

Next, Sami language proficiency was cross-tabulated with age. For all three proficiency areas, an inverse relationship can be observed between proficiency in Sami language(s) and age,

however, Pearson's chi-square analyses determined the relationships between reading and speaking to be insignificant (p=0.378 and 0.718, respectively). The Pearson's chi-square did determine that a relationship exists between writing in Sami and age (p = 0.026). The results of these cross-tabulations are summarized in Table 4.7.

Table 4.7: Cross-tabulation between age and Sami language proficiency

			"I read Sami"		
			No	Yes	Total
What is your age?	18-34	Count	8	13	21
		% within What is your age?	38.1	61.9	100.0
	35-44	Count	12	7	19
		% within What is your age?	63.2	36.8	100.0
	45-54	Count	11	10	21
		% within What is your age?	52.4	47.6	100.0
	55-64	Count	8	6	14
		% within What is your age?	57.1	42.9	100.0
	65+	Count	4	1	5
		% within What is your age?	80.0	20.0	100.0
Total		Count	43	37	80
		% within What is your age?	53.8	46.3	100.0
			"I speak Sami"		
			No	Yes	Total
What is your age?	18-34	Count	7	14	21
		% within What is your age?	33.3	66.7	100.0
	35-44	Count	8	11	19
		% within What is your age?	42.1	57.9	100.0
	45-54	Count	8	13	21
		% within What is your age?	38.1	61.9	100.0
	55-64	Count	8	6	14
		% within What is your age?	57.1	42.9	100.0
	65+	Count	2	3	5
		% within What is your age?	40.0	60.0	100.0
Total		Count	33	47	80
		% within What is your age?	41.3	58.8	100.0
			"I write in Sami"		
			No	Yes	Total
What is your age?	18-34	Count	9	12	21
		% within What is your age?	42.9	57.1	100.0
	35-44	Count	16	3	19
		% within What is your age?	84.2	15.8	100.0

	45-54	Count	15	6	21
		% within What is your age?	71.4	28.6	100.0
	55-64	Count	10	4	14
		% within What is your age?	71.4	28.6	100.0
	65+	Count	5	0	5
		% within What is your age?	100.0	0.0	100.0
Total		Count	55	25	80
		% within What is your age?	68.8	31.3	100.0

4.3.3: Cultural Activities

There are a variety of activities associated with reindeer herding. These activities contribute to the success of a reindeer herding family and a community overall. They also provide sources of traditional knowledge, therefore these activities contribute to cultural capital. The questionnaire contained a table in which respondents could record who in their family was responsible for specific activities involved in reindeer herding. Responses to this section of the questionnaire are summarized below in Table 4.8, and statistically different responses between men and women can be seen in **bold** in the 'p' column. (Note: not all families participate in all activities, therefore N varies between them).

Table 4.8: Participation in culturally significant activities by gender

Activity	N	Men %	Women %	Total% (where activity present in household)	Total % of households where activity takes place (of 63)	P
Calf marking	80	100	95.2	98.8	98.4	0.092
Business administration	73	84.9	60.0	78.1	90.5	**0.022**
Gathering herd	79	93.2	15.0	73.4	96.8	**0.000**
Separating the herd	80	98.3	90.5	96.3	98.4	0.105
Moving the herd	77	98.2	76.2	92.2	93.7	**0,005**
Fencing work	75	94.6	36.8	80.0	92.1	**0.000**
Feeding reindeer	71	94.2	84.2	91.5	87.3	0.179
Coordinate activities for Sameby	71	96.1	60.0	85.9	87.3	**0.000**
Consulting with other land users	69	87.8	50.0	76.8	82.5	**0.001**
Teaching and training others	47	71.4	66.7	70.2	57.1	0.756
Slaughtering reindeer	77	96.5	90.0	94.8	95.2	0.260
Preparation of meat for the household	71	90.2	70.0	84.5	85.7	**0.034**
Preparation of meat for sale	44	87.9	63.6	81.8	54.0	0.071
Hunting	76	100.0	60.0	89.5	93.7	**0.000**
Fishing	72	94.4	94.4	94.4	88.9	1.000
Fuelwood preparation	75	100.0	70.0	92.0	92.1	**0.000**
Gathering berries, mushrooms and wild plants	67	74.5	100.0	82.1	81.0	**0.013**
Making of handicrafts for household use	43	77.8	87.5	81.4	44.4	0.428
Making of handicrafts for sale	28	52.9	90.9	67.9	28.6	**0.036**

As a further determinant of participation in culturally significant activities, interviewees were asked, "When it comes to daily tasks involved in reindeer husbandry, what are some things men do more often than women?" In response to this question, 3/9 interviewees noted that reindeer herding is still male-dominated, and 3/9 also stated that men spend most of their time in the field, with the reindeer. One stated that while herding is male-dominated, this is changing.

One man felt that men and women already share the work equally within reindeer herding communities.

When asked what women do more often than men, 4/9 interviewees agreed that women are often responsible for taking care of the family. The second most common themes were that women take care of the administration of the reindeer herding business (3/9) and that they handle the logistics involved in reindeer herding when the men are out in the field with the reindeer, including such things as moving feed from place to place as needed. Two interviewees mentioned that women may have other jobs outside of reindeer herding, more typical "Swedish" jobs. Other tasks mentioned were: attending meetings to consult with other land users (1/9) and doing computer work involved in monitoring the reindeer via GPS (1/9). The quote below describes some of the different tasks done by men and women.

> You can say, the men are working in the mountains. With the machines and doing the hard work you can say. But also the women, they take care of the family, the economy, they help the, to fix the logistic in the Sami village. We need food for the reindeer – someone has to drive it from one place to another – the women. We need plastic forks to put the food into – the women take care of that. So, if we take one day when we're moving a reindeer herd from one corral to another corral, for example when they moving from the forest up to the mountains, and we put out 10,000 kilos of food, often it's the women's work to carry that. From one place to the car, from the car eto the other place, and out to the reindeer. So, they also have a hard work. But they take care about the logistic.
>
> -Male, age 45-54

4.4: Institutional Capital

4.4.1: Political Action

In designing this study, political action was selected as an important variable in this regard because according to Morrow (2008), ethnic minorities are often at risk of having diminished political power within the context of a much larger majority population. A lack of participation, indicated for the purposes of this framework by a low proportion voter turnout in Swedish and Sami Parliament elections, as well as a lack of participation in reindeer herding plans, may express disengagement among the Sami when it comes to Swedish politics.

When asked about their voting behaviour in Swedish elections (municipal, regional and national), respondents were asked to quantify their voting behaviour on a 5-point Likert scale ranging from "Never vote," to "Always vote". The highest proportion of respondents answered "Always vote," at 50.6 %, and an additional 22.2% selected "Usually vote." There was no

significant relationship found through a chi-square analysis between male and female respondents (p=0.963), or between age groups and voting behaviour (p=0.446). When asked if their voting behaviour had changed since 1986, 81.3% of respondents reported "No change" (n=80). When asked about Sami Parliament elections, on the same 5-point Likert scale as with Swedish elections, 56.4% responded "Always vote," and an additional 16. 7% responded "Usually vote". No significant relationship was found as a result of a chi-square analysis between male and female respondents (p=0.191) (Appendix K). In addition, interviewees were asked, "Do you think that voting in local, regional and national elections will benefit you in some way? Why or why not?" In response, 4/9 interviewees agreed that it is good or important to participate, and 4/9 stated that you cannot be angry about the way things are if you don't participate when you have the opportunity. Two interviewees stated that they are not politically interested, but still vote. One reindeer herder stated that it is difficult to choose a party that will have the greatest impact on their lifestyle, and another said that some parties are better for reindeer herders. One man stated that he does not believe voting will benefit him at all.

Interviewees were next asked a similar question, with regard to Sami Parliament elections. As a response, 4/9 interviewees stated that it is difficult to choose a party to vote for that will have the most benefit to reindeer herders, because party platforms vary widely and no single party exists to promote the interests of reindeer herders. Three interviewees felt that Sami Parliament elections were more important than Swedish elections, and two interviewees felt that reindeer herders were under-represented within Sami Parliament.

As a further indicator of political action among respondents, the questionnaire contained questions regarding participation in Reindeer Herding Plans (RHPs), a landscape management system used to understand the importance of certain areas and types of vegetation to reindeer herders. Overall, 95.9% of respondents cited some form of participation in RHPs (n=74); 100.0% of men and 85.0% of women (Table 4.9). A Pearson's chi-square analysis determined that the relationship between gender and participation in RHPs is statistically significant (p=0.004).

Table 4.9: Participation in Reindeer Herding Plans by gender

			"I participate in Reindeer Herding Plans"		
			No	Yes	Total
What is your gender?	Male	Count	0	54	54
		% within What is your gender?	0.0%	100.0%	100.0%
	Female	Count	3	17	20
		% within What is your gender?	15.0%	85.0%	100.0%
Total		Count	3	71	74
		% within What is your gender?	4.1%	95.9%	100.0%

The topic of RHPs was also covered during interviews, when interviewees were asked, "Do you participate in Reindeer Herding Plans? Why or why not? How do you think they benefit reindeer herding communities?" Of the nine total interviewees, only one did not participate actively in RHPs, citing that she had not yet had time to become involved (woman, age 18-34). Overall, 5/9 interviewees felt that RHPs were an important tool that allowed them to clearly communicate the most important areas of land and how they are used, making it easier to work in consultation with other land users and providing them with greater credibility. Interviewees were also asked if they believed there were any negative aspects of the RHPs, to which three responded "No," and one stated that she would have to wait and see. Two interviewees felt that a potential problem is that competing land interests might looks at RHPs without the understanding that landscape use is in a constant state of flux – reindeer herders use the entire landscape, but different areas are more important from year to year. One individual felt that the RHPs were too late and that the landscape is already being over-used by other industries. The following quote illustrates a typical response regarding reindeer herders' use of the Swedish landscape: "We use 100% of the area, but not every year. It's depending of the weather – snow, ice, everything." (Male, age 45-54)

4.4.2: Communications Services

The availability of communications services is an important consideration because, besides improving preparedness in emergency situations as suggested by Colten et al. (2008),

communications may prove to be key in maintaining communications between family members and family groups participating in reindeer herding practices. There were no interview or questionnaire questions specifically targeted toward an understanding of this indicator, however, time in the field made it obvious that mobile phone and internet services were widely available, even in seemingly remote areas. In addition, in a questionnaire question, respondents were asked, "Can you describe any specific effects that technology used in herding has had on your household or community?" and several responses were received referring to the availability of communications services. Of respondents who answered this question (n=53), 17% (n=9) made reference to mobile phone service. The majority of respondents stated that mobile phone service facilitated communication between herders and family members, while one person explained that it increased the safety of the work environment.

4.4.3: Legislation Governing Reindeer Herding

Legislation governing reindeer herding practices is considered in the framework due to the fact that, while herding is a right among the Sami people, it is not without regulation governing where and how it may be performed (Josefsson, Bergman & Ostlund, 2010; Kuokkanen, 2009). These regulations may either support or hinder herding practices (or both), affecting community adaptive capacity. In order to understand reindeer herders' knowledge of legislation governing their activities, gauge the effects of said legislation and understand herders' personal feelings in this regard, respondents were asked a series of questions via the questionnaire. First, respondents were asked if they were aware of legislation governing their herding activities. Of respondents to this question (n=80), 80.0% of respondents answered in the affirmative (n=64); 84.5% of men and 68.2% of women (p=0.104).

Respondents were next asked to list the legislation that influence their activities as a reindeer herder. Of the respondents who chose to list legislation (n=58), 87.9 % (n=51) cited the Reindeer Husbandry Act, and additional 20.7% (n=12) cited the Forestry Act, 15.5% (n=9) mentioned some form of environmental legislation, and 13.8% (n=8) cited hunting and/or predator protection legislation. Next, respondents were asked to describe how the legislation they cited may help or hinder their reindeer herding activities (open-ended). Overall, the number of respondents believing that impacts were positive was the same amount of respondents who believed the impacts to be negative: 28.2% (n=13) of respondents (total n=46) cited negative

and/or positive feelings toward the impacts of legislation on reindeer herding. An additional 17.4% (n=8) of respondents found current legislation to be ineffective, and 13.0% (n=6) felt as if legislation was a controlling influence on reindeer herding.

The following question (open-ended) asked respondents whether or not they had noticed changes to legislation governing reindeer herding since 1986. Of those who chose to answer this question (n=37), 73.0% (n=26) answered "Yes", while 16.2% (n=6) answered "No", and 8.1% answered "Not applicable. Of the respondents who answered "Yes", 46.2% (12) believed legislation had changed for worse, 15.2% (4) for the better, and the remaining 38.5% (10) provided no clear distinction. Of those who felt that legislation had changed for the worse, the most common theme among respondents was the feeling of greater restrictions toward reindeer herding (n=5). Three respondents mentioned changes to the Forestry Act, two of whom took issue with the increasing logging and its effect on grazing land. Another two respondents cited changes to regulations regarding their ability to hunt predators that threaten their herds.

The final question dealing with legislation asked respondents to gauge the overall adequacy of legislation governing reindeer herding activities on a 5-point Likert scale ranging from "Very inadequate" to "Very adequate". Of the respondents who answered this question (n=52), the highest proportion of respondents answered "Very inadequate," with a total of 55.8% (n=29). An additional 15.4% (n=8) answered "Somewhat inadequate" and no respondents felt that legislation was "Very adequate" (Appendix L).

Finally, during interviews, participants were asked how they perceived that their reindeer herding activities had been impacted by current legislation. Overall, 5/9 participants discussed forestry, three of whom stated it was the biggest issue facing reindeer herders with regard to legislation because, while consultations with herders have become common practice, the results of these discussions are not usually legally binding in the long-term. Two participants stated that the Reindeer Husbandry Act was ineffective, and three respondents stated that legislation imposes restrictions that make reindeer herding difficult. When asked whether legislation had become better or worse since around 1986, five participants stated it had become better, while one noted it was worse and another that it was both better and worse. The most common reason for the improvement was changes to forestry legislation and the introduction of FSC – a form of sustainable forest certification – for which consultations with indigenous peoples are mandatory. Two participants also noted that RHPs were responsible in part for the improvement. The

following quote is one of the responses regarding legislation, illustrating beliefs regarding the effectiveness of legislation governing forestry in Sweden:

> The Forestry Act doesn't benefit us it's more for the land/forestry owners. It says in it that there should be consultations but they have been very few. Sure there have been some but when an area have been saved the next years they can use it anyway.
>
> -Woman, age 65+

4.5: Natural Capital

4.5.1: Forest Reserve

Reindeer herding lands being used by the Sami are facing increased land-use pressures from multiple industries (Furberg, Evengard & Nilsson, 2011) and noted climatic shifts (Tyler et al., 2007). These shifts have a profound effect on pastoralism, limiting reindeer food supply and changing seasonal movements of the herds (Tyler at al., 2007; Riseth et al., 2001; Furberg et al., 2011), making them important considerations in the adaptive capacity framework.

With regard to available forest reserve (an indication of lands available to reindeer for the purposes of grazing and migration), respondents were asked a series of questions regarding the availability of natural foods and the necessity of supplementing their herds' diets. First, respondents were asked to rate the availability of natural foods over the last year on a 5-point Likert scale from "Low" to "Much better". The highest proportion of respondents (n=78) indicated that it was the "Same as always," at 41.0%, and 32.1% indicated that it was "Low". When asked to rank how often their reindeer required supplemental food during the same time period on a 5-point Likert scale ranging from "Always" to "Never", "Almost never" and "Never" were the most popular responses, with 26.6% and 25.3%, respectively. When asked to select the reason for which they supplemented their herd's food in the last year, 40.7% (n=44) responded that they supplement food during reindeer migration, while 22.2% (n=24) cited periods of famine as a reason (Appendix M).

Respondents were asked the same series of questions about the availability of natural food compared to the year 1986. When asked about the availability of natural food in 1986 compared to the last year on a 5-point Likert scale ranging from "Low" to "Much better," the highest proportion of respondents to which the question applied responded "Better" (22.8%, n=18). When asked how often they needed to supplement their herd's food in 1986, the highest

proportion of respondents to which the question applied responded "Never," at 19.7% (n=15). Overall, no statistically significant differences were found between the responses of men and women in relation to any of the above questions.

Finally, when asked to select their reasons for supplementing reindeer food in 1986, the highest proportion of respondents to which the question applied answered, "I supplement food during reindeer migration," at 43.2% (n=16) (Appendix N). As a further indicator of available forest reserve, documents have been obtained from the Swedish Forestry Agency confirming a reduced area of forested land: while 23,232,000 hectares of productive forest land was present according to the SFA's 1999 Statistical Yearbook of Forestry between the years 1983 and 1992 (Skogsstyrelsen, 1993), this figure dropped to 23,099,000 hectares for the years of 2008-2012 (Skogsstyrelsen, 2013).

4.5.2: Seasonal Variation

Another important consideration when assessing the natural capital of reindeer herding communities is seasonal or climatic variation, as this can have a profound impact on the timing of herd migration and the ease with which the reindeer may access vegetative food beneath snow and ice in winter (Tyler et al., 2007). For the purposes of understanding any changes taking place from the reindeer herders' perspective, the questionnaire included questions about variability in climate. First, reindeer herders were asked the yes/no question: Have you noticed changes to the climate in your community since 1986? Of the respondents who chose to answer this question (n=72), 73.6% answered in the affirmative (n=53). A Pearson's chi-square analysis found no significant different between the responses of men and women.

When asked to describe the climatic changes that have occurred since 1986, questionnaire respondents most commonly cited increased precipitation: 35.8% (n=19). The next most common responses were warmer and/or longer autumns (30.2%, n=16) and warmer winters (22.6%, n=12). Poor ice conditions was another common theme (20.8%, n=11), as well as changes in vegetation growth (11.3%, n=6) and a warmer climate overall (11.3%, n=6).

4.5.3: Predation

In order to understand the challenges faced by reindeer herders where it concerns predation on their herd by a variety of species (bears, wolves, wolverines, lynx, and golden eagle primarily), respondents were asked to estimate the percentage of their herd lost to predators in

the last year and in 1986. The mean reported herd loss in that last year was 30.9% (minimum 1.0%, maximum 75.0%, mode 30.0%) (n=67). The mean reported herd loss in 1986 was much lower at 11.2% (minimum 0.0%, maximum 60.0%, mode 5.0%) (n=28). With regard to predation, no statistically significant differences were found between the responses of men and women.

In addition the aforementioned questionnaire questions, documents were obtained from the Swedish Environmental Agency confirming increasing populations among some of the above-mentioned predators. Numbers of golden eagle and lynx, however, appear to have fallen in the last decade: in 2004, 214 golden eagle nests were observed, compared to 235 in 2011 (Viltskade Center, 2004; 2012) and 260 lynx litters were observed in 2005-2006, compared to 245 in 2011-2012 (Viltskade Center, 2006; 2012). Wolves and wolverine did experience population growth, however; wolves from 11 observed litters in 2004 to 23 in 2008-2009, and wolverine from 7 litters in 2004 to 125 in 2012 (Viltskade Center,2005; 2013). In addition, a 2011 study by Kindberg et al. found that the Swedish brown bear population grew at a rate of 4.5% annually on a national level between the years of 1998-2007.

4.6: Economic Capital

4.6.1: Employment Levels and Opportunities

Economic capital is key to the creation of resilient communities, as it defines the material resources available in situations requiring adaptation and is particularly pertinent in preparing for emergency situations, where preparation measures such as the purchase of insurance prior to an acute event depend highly on one's disposable income (Tierney et al., 2001). With regard to reindeer herding communities, multiple sources of income may indicate a commitment to continuing traditional pastoralist activities, even at times when they are not sufficient as a sole source of income. To this effect, respondents were asked to identify how many means of employment they had in the last year. Overall, the highest proportions of respondents identified 2, 3 or 4+ sources of income: 30.9% (n=25) selected 2 sources, 27.2% (n=22) selected 3 sources and 32.1% (n=26) selected 4+ sources. A Pearson's chi-square analysis identified that a statistically significant difference existed between men and women in this area: the highest proportion of men selected 4+ forms of employment (42.4%, n=25), while only 4.5% of women

(n=1) selected 4+ (p=0.003). Women were much more likely to have 2 or 3 sources of income: 31.8% (n=7) and 40.9% (n=9), respectively) (Table 4.10).

Table 4.10: Cross-tabulation of employment by gender

			How many forms of employment did you have in the last year?					
			0	1	2	3	More than 3	Total
What is your gender?	Male	Count	0	3	18	13	25	59
		% within gender	0.0	5.1	30.5	22.0	42.4	100.0
	Female	Count	2	3	7	9	1	22
		% within gender	9.1	13.6	31.8	40.9	4.5	100.0
Total		Count	2	6	25	22	26	81
		%	2.5	7.4	30.9	27.2	32.1	100.0

When asked to identify how many sources of employment they had in 1986, men and women alike selected a lower job count than in the previous question, both citing one source of employment in highest proportion: 22.2% (n=12) and 33.3% (n=6), respectively, for an overall proportion of 25% of respondents. No statically significant link was found between the responses of men and women (p=0.631).

Next, respondents were asked to identify the approximate proportion of their household income that is derived from reindeer herding. A relatively balanced distribution of responses was observed amongst the four income categories, the least frequent response being 76%-100% of income. A cross-tabulation analysis reveals that women identified lower household incomes from herding than men, the largest proportion selecting "25% or less" at 38.1% (n=8). However, no statistical significance was found in comparing the responses of men and women (p=0.657). Respondents were next asked to identify the proportion of their household income derived from reindeer herding in 1986. The majority of respondents to which this question applied selected 75%-100%, at 19.4% (n=14). Again, there was no statistical significance identified in comparing the responses of men and women (p=0.447) (Appendix O).

Finally, an individual's role within the household was chosen as an indicator to help explain who is participating in what parts of reindeer herding and clarify questions around

gender roles. Table 4.11 summarizes the responses to this end, cross-tabulated with gender for comparison. No significant correlation was found between household role and gender when chi-square analyses were conducted, except when it came to the role of homemaker, in which case women were more than four times more likely to identify in this role (p=0.003).

Table 4.11: Cross-tabulation of role in household by gender

			Role in household					
			Primary Wage Earner	Secondary wage earner	Homemaker	Dependent	Other role	Total
What is your gender?	Male	Count	38	19	4	4	1	57
		% within Gender	66.7	33.3	7.0	7.0	1.8	
	Female	Count	11	9	7	3	0	21
		% within Gender	52.4	42.9	33.3	14.3	0.0	
Total		Count	49	28	11	7	1	78

4.6.2: Trends in Subsistence

Respondents were next asked to identify what proportion of reindeer meat harvested is used for household consumption in the last year and in 1986. The mean for household reindeer meat consumption in the last year was 12.9% (minimum 0.0%, maximum 100.0%, mode 5%, n=65). For 1986, the proportion was 8.9% (minimum 0.0%, maximum 100.0%, mode 3%, n=27).

4.6.3: Incomes and Economic Assets

As an indicator of financial capital among reindeer herders, tax information was collected regarding assessed incomes and their sources for the 2011 fiscal year with the help of the Vilhelmina Tax Board. Overall, the average assessed income among the 68 reindeer herders for whom information was available was $22,262.80 CAD, ranging from $0.00 to $81,481. When regarding incomes with a gendered perspective, women in the sample tended to make significantly more money than men: The average income for men was $17,780.87, with a range between $0.00 and $49,436.00 (n=42), while women had an average income of $29,502.85, with a range between $5814.00 and $81,481.00 (n=26) (Table 4.12). A one-way analysis of variance (ANOVA) determined this difference in incomes to be statistically significant (p=0.000). As part

of the available tax information, it was also possible to determine the percentage of each individual's income that derived from entrepreneurial activities (most likely reindeer herding, although potentially from a combination of reindeer herding and other business endeavors in some cases). Overall, individuals in the sample derived 52.09% of their personal income from reindeer herding. When this figure was analyzed for men and women separately, a sizeable difference existed: men derived an average of 69.16% of their personal income from entrepreneurial activities, while this figure was only 24.52% for women. Still, an ANOVA determined that a statistically significant difference did not exist (p=0.135).

Table 4.12: Descriptive statistics of income (CAD) by gender in Vilhelmina North and South districts

	MEN	WOMEN
N	42	26
Mean	17780.87	29502.85
Median	17680.00	26809.00
Standard Deviation	13944.99	17794.75
Range	49436.00	75667.00
Minimum	0.00	5814.00
Maximum	49436.00	81481.00

4.6.4: Market Controls on Reindeer Product Pricing

The main source of income that can be derived from reindeer herding is through the sale of the animals' meat, yet the market for reindeer meat in Sweden remains relatively small, composing merely 0.6% of the total meat market (Bostedt, 1998). The niche status of the market means that it is very susceptible to outside pressures such as increased competition, environmental disasters like Chernobyl and fluctuating product prices, among other things (Keskitalo, 2008). From around 1970, meat prices experienced 2½ decades of almost constant decline, from ~$3.40 CAD/kg to $1.30 CAD/kg (Bostedt, 1998). Since the mid-1990s, however, there has been a period of steady growth, resulting in consumers paying a record high of $13.60 CAD/kg[5] as of January, 2014, due to high demand as consumers seek more natural food options (Radio Sweden, 2014).

[5] Converted from 80 SEK May, 2014 at a rate of 1 CAD:5.9 SEK

4.6.5: Equipment and Assets

Finally, the purchase of economic assets in the form of modern technologies that aid in the herding process serves as a further indicator of economic assets in the community and the degree to which their use is gendered. To understand what kinds of modern equipment and technologies were most important to reindeer herders, questionnaire respondents were asked to list the types of equipment commonly used by members of their household. Table 4.13 summarizes the most commonly listed types of equipment based on the number of households that listed each type of equipment. In terms of the gender of equipment users, the results to the aforementioned question were separated and then cross-tabulated chi-square tests were conducted to determine the statistical significance of observed differences between the equipment-use patterns of men and women. Overall, equipment use among the Swedish Sami is gendered in favour of men, lending further support to the results indicating that men tend to spend the most time in the field with the reindeer. The use of cars, however, was significantly less segregated by gender, supporting the tendency of women to participate in logistical activities that support the overall efforts involved in reindeer herding. Table 4.14 summarizes these results.

Table 4.13: Summary of Household Equipment Use

Type of Equipment	N (of 63 total participating households)	% of total households using equipment
Snowmobile	59	93.7
Trailer	47	74.6
ATVs	39	61.9
GPS/GIS	39	61.9
Car	35	55.6
Motorcycle/Dirt bike	19	30.2
Boat	7	11.1
Truck/Pickup	7	11.1
Other: Binoculars, firearms, dogs, etc.	32	50.8

Table 4.14: Summary of equipment use by gender

Type of Equipment	N (where use of each type of equipment is present in household)	Men%	Women%	Total % of Respondents citing use of equipment	P
Snowmobile	75	100.0	80.0	87.7	**0.001**
Trailer	62	100.0	77.8	71.6	**0.001**
ATVs	53	97.5	61.5	58.0	**0.000**
GPS/GIS	49	94.1	53.3	49.4	**0.001**
Car	45	100.0	91.7	54.3	0.094
Motorcycle/Dirt bike	26	72.2	12.05	17.3	0.005
Truck	9	100.00	100.0	11.1	0.003
Boat	8	100.0	100.0	9.9	0.003

Also as part of the questionnaire, respondents were asked in an open-ended question to identify how the kinds of equipment used affected their reindeer herding activities. Overall, 56.8% of respondents stated that the use of the listed equipment simplified, facilitated or otherwise made reindeer herding work easier (n=46). An additional 17.3% stated that it was a necessary, everyday reality of modern reindeer herding (n=14). Several participants noted drawbacks to the use of modern technologies, despite their benefits. The most popular of these was that equipment often comes with a hefty price tag: 11.1% of respondents stated as much (n=9). Another negative aspect of equipment use was its potential effect on the user's body; snowmobiles, ATVs and motorcycles can cause injuries due to the constant vibrations to which they expose their user, and 6.2% of respondents described these problems (n=5). Finally, 3 respondents (3.7%) stated that the use of equipment could actually make the work more difficult at times, as a result of constant maintenance work, for example. In general, sentiments regarding modern equipment use in reindeer herding activities were echoed in subsequent interviews: interviewees felt that modern equipment was necessary to keep up with the pace of development and facilitate the work, and that, despite elevating the cost of reindeer herding, equipment was necessary in most modern reindeer herders' lives. Box 4.2 contains an excerpt from the focus group-style interview, detailing the necessity of modern technologies in modern reindeer herding activities.

Box 4.2: Modern Equipment in Reindeer Herding

AC (Woman, aged 35-44): But you know, life is big difference now than before because we are not living in the mountains with the reindeers all year round. You have children there to go to school, and maybe the father wants to, or the mother wants to see these children sometimes, so you need the machines to make it faster. And you know now we need this.

Ka (Woman, aged 18-34): And today we have a lot bigger herds, so much easier to have good machines to keep them together when we work with the reindeers.

Overall, the view of respondents toward the equipment and technologies that they employ for the purposes of reindeer herding are that while they have notable drawbacks (including their substantial cost to own and maintain and the health issues associated with their use), they are inextricably tied to the work of reindeer herders looking to succeed in a modern, industrialize society.

5. DISCUSSION OF FINDINGS: Assessing Comparative and Gendered Dimensions of Adaptive Capacity

5.1: Introduction to the Assessment

The following section assesses the adaptive capacity of reindeer herding communities in Sweden by synthesizing the results of the study as discussed in the previous section. It explains each form of capital in relation to the indicators and provides a qualitative interpretation of whether the indicators contribute positively or negatively to adaptive capacity. It is difficult to assign numerical values to adaptive capacity, therefore, indicators are classified on the basis of whether they show low, moderate or high contributions to positive adaptive capacity by considering their change over time and comparing their status to national averages and other cases as applicable.

The assessment is broken down into the forms of capital to which each indicator relates, as in the previous section, and also discusses the interrelations between them. While it is important to note that the six forms of capital are interrelated in many ways, only key relationships are discussed. At the end of each subsection, tables provide a summary of the contributions to adaptive capacity relating to each form of capital. A summary is provided at the end, and the influence of gender on adaptive capacity is discussed separately at the end of the section.

5.2: Assessment of Adaptive Capacity

5.2.1: Contributions from Indicators of Social Capital

Social capital has been the focus of a great deal of literature, but for the purposes of this study, it refers to the assets derived from community relationships and social norms, each person's contribution to these and the benefit that can be derived from them by community members (Portes, 1998; Putnam, 1995; Coleman, 1988). With regard to reindeer herding communities, the indicators considered as contributors to social capital were the age distribution of respondents, gender distribution (number of men to number of women), community attachment and engagement, and perceptions surrounding equality of reindeer herders within society.

Social capital amongst the reindeer herding Sami can be considered **moderate.** This is evident in somewhat conflicting signals arising from different perspectives related to the factors that make up capital. The presence of an even age distribution among questionnaire respondents indicates that while elders are present and active within the community, they do not represent the majority of the sample, which may indicate a decreased ability to respond to acute changes, as indicated by Morrow (2008). Put simply, elder populations tend to have greater reliance on institutions and younger members of a community as a result of deteriorating health, decreasing their ability to act independently and therefore lowering adaptive capacity of the community overall. An even age distribution indicates that adaptive capacity is positively influenced in this case, as elders are available for the purposes of teaching and training, yet do not form such a large group that their presence places significant pressure on other herders and institutions for their care. Further, the very young and very old do not possess the same number of community ties as those in adulthood, therefore, an even age distribution indicates a greater capacity to adapt to change through the mobilization of relationships as assets (Klenk et al., 2011). This is particularly important where "bridging" and "linking" social capital are concerned, as the elderly may have many strong familial relationships ("bonding"), but may lose "bridging" relationships (with friends and colleagues) as they age and may no longer have the capacity to influence "linking" relationships (with those in positions to influence from outside the community) due to their reduced presence within the workforce.

I'm not quite sure how to frame this. Did you find evidence that they had less influence as they aged? If not, you don't have evidence either way. So you could say something like, :

In some indigenous communities, elders are highly revered and may be influential even beyond their official employment years (citation). My study did not provide evidence supporting or denying this influence in reindeer herding communities. Therefore, assumptions of previous research were carried forward here. Future research might explicitly address how age affects social capital within these communities to assist in better understanding this relationship.

With regard to gender distribution, an even split between men and women would be more favourable with respect to community adaptive capacity, as it may indicate a higher degree of gender equality in the community and employment opportunities therein for both men and

women. Nevertheless, the fact that 27.2% of respondents were female represented a larger minority than expected when considering that recent statistics indicate that 85% of active reindeer herders are men (Sami Parliament, 2009). The fact that the presence of women in the sample was almost twice as high as expected given this statistic may indicate that a relatively narrow definition of "reindeer herder" has been used in the past and/or little attention paid to gender dynamics among reindeer herders. As indicated by one interviewee:

> …What's counted as a reindeer herder? It's most of the things that the men do. And today, I think, reindeer herding is many things. So also it is to learn children and take care of the language – that kind of stuff could be a part of reindeer herding…
>
> -Woman, aged 18-34).

Still, the difference could also be due to the fact that women in reindeer herding communities tend to spend more time at home than men, and therefore found the questionnaire accessible, exaggerating their presence in the sample[6]. Despite the undeniable fact that women remain a minority of reindeer herders, neither respondents nor interviewees reported on workplace inequalities. Yet within families, it appears that sons are still much more likely to inherit the family reindeer herding business than daughters. This indicates that regardless of the perception of equal opportunities, gendered expectations may still be at work within reindeer herding communities. This division of labour remains significant as it affects both women and men. Woman may want to pursue a career in reindeer herding, but may not be supported to do so, while a larger proportion of Sami men may feel that they are required to follow a predetermined path. Two quotes illustrate the male and female perspectives on this issue:

> I think it's a little bit like boys, they feel a lot of pressure, and they stop studying with high school. They have to go work. But girls they don't have the same pressure, so they can take time to study more.
>
> -Man, age 18-34, and
>
> I think it's safer when we're around […] But it's sad because – reindeer herding - it's kind of a macho, a man work today, at least, like, the daily work with it, and it's sad because I think we lost much knowledge and that kind, from not females in the work every day in winter.
>
> -Woman, age 18-34

Conversely, one may think of the gendered division of labour in reindeer herding communities as a kind of adaptation strategy; the prevalence of men in the field has made it possible for women

[6] The Swedish Census, unfortunately, does not classify citizens on the basis of ethnicity or the specific occupation of reindeer herding (herders are lumped into the entrepreneurial category), therefore the exact proportion of women to men who self-identify as Sami reindeer herders remains unclear.

to pursue higher levels of education (see section 5.2.2) which may in turn impact their ability to seek gainful employment in other fields (see section 5.2.6). As a result, women are able to contribute to the overall financial stability of their families in a way that would be unlikely to take place through a reindeer herding enterprise alone. Still, they are able to maintain strong ties to the cultural significance and fulfillment of reindeer herding through the efforts of their male counterparts.

Another key element in understanding the value and strength of social capital among reindeer herding communities is to consider the strength of attachment to their way of life and the resultant cohesion within and between reindeer herding districts ("Bonding" and "bridging" social capital). The fact that respondents noted a strong degree of attachment to their communities and intentions to stay for an undefined length of time serves to demonstrate this point, but it was also obvious when considering the number of forms of employment herders pursue during the year in order to sustain themselves. Despite the relative lack of economic security from reindeer herding enterprises, it seems herders will work as many jobs as necessary in order to continue their way of life. This finding is similar to that of Riseth et al. (2006) who, in examining the reasoning for continuing reindeer herding, a form of employment that is not economically sustainable, discusses alternative motivations. While some do rely on reindeer herding as a sole means of income, for others, it may be equally important because of its subsistence value or its attraction as a unique lifestyle (Riseth et al., 2006).

Finally, the overwhelmingly negative response with regard to feeling respected within Swedish society on the part of interviewees negatively impacts the strength of social capital in reindeer herding communities, particularly given their status as a very small minority within the country (about 2,500 reindeer herders compared to 9.6 million Swedes), and indicates weakness with regard to "linking" social capital. This is not to say necessarily that the limited number of interviews indicates a certainty regarding the perceptions of Swedes toward reindeer herders, however, the perpetuation of these perceptions amongst reindeer herders may become a self-fulfilling prophecy. Alternatively, these sentiments may provide a rallying point, strengthening bonds between community members. It is crucial to recognize that while perceptions regarding a lack of respect may or may not be justified, they are derived from hundreds of years of assimilatory policies enacted by the Swedish government, which have only been repealed

relatively recently. Indeed, interviewees suggested that respect for reindeer herders may be increasing within Swedish society:

> …So I think it will be better in the future. I hope. They have started to learn and to educate the children and I think in […] the school more than before. So, I think it help [sic] a little better understanding in the future about Sami people and how the reindeer people live.
>
> –Woman, aged 18-34

A summary of the contributions to adaptive capacity from social capital can be found in Table 5.1.

Table 5.1 - Summary of Contributions to Adaptive Capacity from Social Capital

Type of capital	Indicator	Impact of Indicator on Adaptive Capacity within Sample	Change since 1986 (as known)
Social	Age	+	
	Gender	+/-	
	Community attachment/ engagement	+	
	Equality	-	↑

5.2.2: Contributions from Indicators of Human Capital

Human capital refers to changes undergone by individuals that provide them with new assets and functional levels (Coleman, 1988). As indicators of human capital, the proportion of elders who participate in training others was considered, as well as education levels of all community members (as represented by highest level of education attained and language proficiency). Overall, human capital in reindeer communities can be considered moderate to high. Where teaching/training is concerned, 40.7% of the sample participated in training, indicating a strong transfer rate of traditional knowledge within reindeer herding communities. Participation among age groups was relatively balanced, indicating that little change has taken place in this regard in the recent past and that this trend will continue into the foreseeable future. As noted by Ermine & Pittman (2011), the transfer of knowledge between generations is particularly important in the context of indigenous communities in terms of the continuation of traditional livelihoods.

Where formal education is concerned, 28.4% of respondents noted some form of post-secondary education, slightly lower than the national average in the same year of 34% (Swedish Higher Education Authority, 2013). A slightly different picture can be observed when considering the education levels in northern counties where reindeer herders live. The most southern of these, Jämtland county, has an overall tertiary education level of 29.4% and the most northern, Norrbotten, of 28.6%. Yet that of Västerbotten County, which is centrally located in reindeer herding territory and contains Vilhelmina municipality, is 34.5% (Statistics Sweden, 2014). The three northernmost counties have an average level of tertiary education totaling 30.8%. These numbers indicate that while reindeer herders' education levels may be below the national average, they tend to be closer to the average education levels in Northern Sweden. It should be noted that gender plays a significant role here – were it not for much higher levels of formal education among women than men, this figure would be significantly lower than the national average, as men in the sample had a rate of post-secondary education of only 11.9%. Given the need for reindeer herders to hold multiple forms of employment, the lower level of formal education could manifest itself as difficulty in finding gainful employment in other sectors that would, in turn, support reindeer herding. Still, an inverse relationship was found to exist between age and education levels among reindeer herders, indicating that education levels have greatly improved over the course of the last several decades. Therefore, the concern may not be significant if the trend toward a greater level of educational attainment continues.

It is difficult to make a direct comparison between reindeer herders and other Swedes with regard to language proficiency due to lack of available statistics, however, it should be noted that Swedish is the most commonly used language in the country, and it is taught to all schoolchildren, whether they are native speakers or not (Swedish Language Council, 2013). In cases where the parents of a child are speakers of a minority language such as Sami, instruction in this language is also available (Swedish Language Council, 2013; Heikkilä, 2010). While English is not an official language in Sweden, nor an official minority language, up to 89% of the population has some knowledge of the language (Parkvall, 2009). Given the status of languages in the country at large, then, competency in multiple languages among the Sami hardly seems surprising. Yet, when comparing reindeer herders to Canadian First Nations, we find dissimilarities. For example, only 17.7% of Canadian First Nations speak an aboriginal language (StatsCan, 2008), compared to 59.3% of respondents in the present study. To make direct

comparisons in this regard would be erroneous given the myriad differences between the histories of these indigenous groups, yet understanding this particular difference sheds light on the relative prevalence and viability of Sami languages and adaptive capacity where it concerns this particular indicator.

It is fair to say that multilingualism is common among Swedes in general, however, where it concerns reindeer herders, the reasons for multilingualism are very practical. As indicated by some interviewees, Sami languages are used in day-to-day reindeer herding activities instead of Swedish, as they offer better descriptors of weather conditions, terrain, reindeer behaviours, etc. As two interviewees stated, due to their herding district's proximity to the Finnish border, a working knowledge of Finnish was useful. Yet another interviewee mentioned that when it comes to the purchase, use and maintenance of equipment used in reindeer herding, instruction manuals are not always available in Swedish, but may be available in English. While these examples of the practicality of multilingualism do not represent statistically significant trends within the dataset, they offer potential explanations for seemingly high levels of language proficiency in the sample. As such, it appears that multilingualism lends itself well to reindeer herding in a number of ways, and therefore has a positive influence on adaptive capacity. A summary of contributions to adaptive capacity from indicators of human capital can be seen in Table 5.2.

Table 5.2 - Summary of Contributions to Adaptive Capacity from Human Capital

Type of capital	Indicator	Impact of Indicator on Adaptive Capacity within Sample	Change since 1986 (as known)
Human	Experience and training	+	
	Education levels	-	↑
	Languages	+	

5.2.3: Contributions from Indicators of Cultural Capital

Cultural capital can take the form of embodied traits or skills, material assets or education (Bourdieu, 1979). To this end, the indicators considered were indigenous ancestry, indigenous language proficiency and participation in culturally significant activities. Overall, cultural capital among reindeer herders can be considered in transition from a place of moderate strength to that of high strength. Indigenous ancestry in the sample was high (80%), reflecting

the inherited nature of reindeer herding as a way of life; children grow up learning the skills necessary to start a reindeer herding enterprise. As such, their heritage contributes positively to adaptive capacity, providing most reindeer herders with years of practical experience and training, and preparing them for the realities of the day-to-day adaptations and flexibilities necessary for success in an ever-changing industry.

Sami language is another key component of cultural capital, in that indigenous languages have a strong link to cultural identity (Kvernmo & Heyerdahl, 2004). As such, it is given special treatment here under cultural capital, separately from overall language proficiency, as discussed above under human capital. Furthermore, as mentioned above, Sami languages are practical tools when used in day-to-day herding activities. This is best expressed in a Sami Parliament policy document:

> They are developed in the conditions that our ancestors lived in, and on the basis of the activities they undertook. The language is closely related to the activities. When the activity ceases, both knowledge of and related terminology disappear. There are many special expressions that are very localized and when documentation work is done on Sami language, it preserves expressions for future generations. (Nordin Jonsson, 2010) [Translated using Google]

A previous study by Valijaervi & Wilbur (2012) had found evidence to suggest that the number of speakers of at least one Sami language (*Pite Sami*) was endangered due to a multitude of socio-economic factors, including the assimilatory legacy of the Swedish government toward the Sami. Sami language proficiency among respondents in the present study was also low, however, the inverse relationship observed between age and proficiency indicates that the study of Sami languages may be on the rise. Some interviewees expressed a belief that it is becoming more popular for youth to pursue an understanding of the Sami languages. Therefore, while today's middle-aged and senior reindeer herders were discouraged from speaking their language in their youth, today's youth are encouraged to do so. Indeed, Valijaervi & Wilbur (2012) mention that their interviewees noted a similar "renaissance" taking place with regard to Sami languages, which bodes well for their influence on adaptive capacity, despite a relatively low number of speakers overall at present.

This indicator is also heavily influenced by gender. Women had higher proficiency than men when it came to reading and speaking a Sami language, but particularly when it came to writing: 50% of female respondents could write in a Sami language, compared to only 25.4% of

male respondents (Refer back to Table 4.6). This disparity means that women contribute proportionally more to cultural capital where it concerns this particular indicator, a fact that is likely linked to their higher rates of post-secondary education, as discussed in the previous section.

A final indicator of cultural capital among reindeer herders that was considered was participation in cultural activities either directly or indirectly related to reindeer herding. As displayed in Table 4.8, respondents were polled regarding their participation in a list of nineteen tasks involved in reindeer herding on a daily basis. Overall, household participation in these tasks was high; 80% of households contained at least one individual participating in each activity. This trend indicates a continuation of reindeer herding as an entrepreneurial, family and community-based endeavor where traditional knowledge is transferred intergenerationally. Still, lower rates of household participation were found among four of the categories: teaching and training of others, the preparation of meat for sale, the production of handicrafts for household use, and the production of handicrafts for sale. This indicates a certain centralization of cultural activities among herders, where it is no longer expected that herding enterprises be self-contained and depend instead on the expertise of professionals for certain processes involved in their administration. These figures can be explained in some cases, but nonetheless indicate that participation in culturally significant activities is decreasing to some degree over time.

Preparation of meat for sale, for example, only existed in 54.0% of responding households, but this may be due in part to Sweden's joining of the European Union in 1995. Although it chose to opt out of the Euro, Sweden has nevertheless had to comply with the European Union's standard practices, which have affected many industries and branches of government (Naurin & Lindahl, 2010; Oberg & Jungar, 2009; Laegreid, Steinthorsson & Thorhallsson, 2004). Among these is the State Board of Agriculture, which had to revise its laws concerning the slaughter of livestock and subsequent preparation of meat for sale in order to ensure Swedish products are suitable for sale in the European market. To a certain extent, slaughter and meat preparation were already centralized within reindeer herding districts, with common facilities being shared among herders in the district. However, evolving Swedish government and EU-related legislative changes have required expensive upgrades to slaughterhouses and processes for meat preparation (State Board of Agriculture, 2008). It is

likely for these reasons that household preparation of meat products for sale may have been abandoned.

Other examples where household participation was relatively low concern the production of handicrafts for both household use and sale. The unique lifestyle and history of reindeer herders represent a boon for Swedish tourism, and the creation of traditional works has provided many Sami with notoriety and celebrity (Utsi et al., 2005). As such, many Sami, including some reindeer-herding Sami, have taken to capitalizing on their heritage as a form of employment. Where it concerns handicrafts, many shops can be found among Swedish villages selling all manner of Swedish and Sami works of art, hand-made clothing, jewelry, household goods, etc. The fact that relatively few households in the sample participate in the production of handicrafts for sale and household use is likely due to A) a lack of free time and a multiple-employment financial framework in most households and B) the fact that the market for handicrafts is already saturated by other Sami, active reindeer herders and otherwise.

Where gender is concerned regarding cultural activities, there were some activities in which a division of labour could be observed between men and women. Broadly, men contribute the most to the physically demanding fieldwork required in reindeer herding enterprises. They participated most in task such as gathering the herds, fencing work and hunting, and also play a central role in activities related to the business end of herding, including business administration and consultations with other land users. Women, on the other hand, tend to play a supporting role, contributing instead to the harvesting of plants, mushrooms and berries to contribute to family food supply and the creation of handicrafts for sale, supplementing the family income. There was some disagreement between questionnaire responses and interviews when it came to the topic of consultation with other land users. While questionnaire responses revealed that this was mostly a task reserved for men, interviewees discussed a greater acceptance of this task among women. This particular result can be considered inconclusive; it may be that the wording within the questionnaire was misleading. In addition, interviewees suggested alternative activities, not included in the list, which women may occupy themselves with to support the livelihood of their family as a whole:

> You can say, the men are working in the mountains. With the machines and doing the hard work. But also the women, they take care of the family, the economy, […] to fix the logistic in the Sami village. We need food for the reindeer – someone has to drive it from one place to another – the women.

-Man, age 45-54

> …The wife is working with something else. So she's the one who pays for the children and that kind of stuff. And they want to go to holiday, have 2 cars, that kind [of thing] – then the wife's supposed to work for that.
>
> -Woman, age 18-34

Table 5.3 provides a summary of the contributions of indicators of cultural capital overall.

Table 5.3 – Summary of Contributions to Adaptive Capacity from Cultural Capital

Type of capital	Indicator	Impact of Indicator on Adaptive Capacity within Sample	Change since 1986 (as known)
Cultural	Indigenous ancestry	+	
	Indigenous language proficiency	+	↑
	Participation in cultural activities	+	↓

5.2.4: Contributions from Indicators of Institutional Capital

Institutional capital can be defined as institutions and governance structures that reduce ambiguity and are designed to contribute to the adaptive capacity of a system (Platje, 2008). For this assessment, the indicators considered were levels of political action, legislation governing reindeer herding and the availability of communications services. Institutional capital among reindeer herders can be considered moderate. The proportion of respondents who noted always voting in Swedish and Sami Parliament elections (50.6%), when contrasted with overall Swedish voter turnout appears comparatively low. Swedish voter turnout tends to be above 80%, with rates in 2010 at 84.63% (Statistics Sweden, 2012). This low turnout negatively impacts community capacity amongst reindeer herders. It signifies a lack of engagement in political processes amongst reindeer herders and further limits their already minute political voice as a very small minority within Sweden as a whole. Even when considered in terms of Sami Parliament elections, reindeer herders are still at a numerical disadvantage: the Sami Parliament deals with all issues related to the indigenous Sami people, of whom there are a total of around 20,000 (Utsi et al., 2012). Reindeer herders, therefore, represent only 12.5% of the Sami voting base.

Overall, respondents' answers regarding their voting behaviour at present and its change since around 1986 indicate that political action has not changed significantly during this time period. Yet such a conclusion completely disregards the advent of two major avenues for political participation since that time: the Sami Parliament, a body created to represent the Sami people to the Swedish government and manage funds and procedures for Sami cultural activities (Sami Parliament, 2014b), was not operational until 1993, and Reindeer Herding Plans were not being piloted until 2000. Consequently, despite the lack of change in voting behaviour, the capacity for political action among reindeer herding Sami has actually increased substantially.

Despite relatively low rates of voter turnout, other institutional tools exist through which reindeer herders may exercise involvement in processes that directly impact their way of life and relationships with other land users. The most prevalent of these is Reindeer Husbandry Plans (RHPs, Renbruksplans in Swedish). These plans are produced as partnerships between academics, the Swedish Forestry Agency, reindeer herders and others for the purpose of mapping reindeer grazing land based on vegetation, migration routes, importance to herders/reindeer and other factors. RHPs were born out of the recognition over several decades that a multiple-use landscape such as Sweden required tools that might serve as the basis for consultation between land users, particularly where it concerned reindeer herders, given their limited voice with regard discussions regarding industrial development in their grazing lands (Jougda et al., 2011). To date, all but one of the 51 reindeer herding districts in Sweden participate in RHPs, and the prevalence of participation within the sample indicates that reindeer herders may prefer RHPs as a form of institutional participation. Indeed, RHPs offer reindeer herders opportunities to express their needs that voting never could; maps produced through the use of vegetation inventories and GPS tracking of reindeer herds, for example, can be used as evidence of the relative importance of certain areas in consultation with other land users, including forest managers, mining interests and hydroelectric projects. Furthermore, RHPs help reindeer herders eliminate inefficiencies in their efforts: GPS tracking allows them to see where the reindeer are from the comfort of home, and vegetation inventory compilations allow for informed decisions on where to move herds, reducing the amount of time and money spent on supplementary feeding (Jougda et al., 2011; Andersson & Keskitalo, 2012). Lastly, participation in RHPs was the sole factor contributing to institutional capital in which a statistically significant difference was observed between men and women, with men participating more often than women. This is perhaps a result of the fact that

RHPs are designed largely with consideration of the aspects of reindeer herding as a business and for the purposes of preserving important field areas, which are largely men's domain. They are not concerned as much with the larger functional levels of reindeer herding in which women are more present, as a family enterprise and livelihood (Figure 1.1).

A second indicator of institutional capital considered here was legislation governing reindeer herding activities. To this end, two facets of this indicator were considered: awareness of legislation and degree of satisfaction regarding legislation. The high degree of awareness regarding legislation indicates that reindeer herders understand that there are laws within which they must perform their reindeer herding activities and that they also have rights as herders that must not be encroached upon by others. This understanding has a positive influence on adaptive capacity; it represents knowledge that can be mobilized, and is particularly important given that reindeer herders must share the landscape with multiple other land users.

Where satisfaction regarding legislation is concerned, the even split of responses between positive and negative attitudes, as well as the belief by nearly half of respondents that legislation had worsened since 1986, may reflect the particularly intertwined nature of institutional capital and natural capital within reindeer herding communities: legislative protection of reindeer herding activities may have increased since the 1980s, but these changes are in effect counteracted by the increasing demands on the Swedish landscape. The Reindeer Husbandry Act (1971), the Environmental Code (1998) and the Forest Management Act (1979), for example, are key pieces of legislation impacting reindeer herders in Sweden. Each of these pieces of legislation has undergone several changes since their creation to better address the needs of reindeer herders (Government of Sweden, 1998, 1979, 1971). Yet a key problem remains: the population of Sweden has been rising steadily for decades (Statistics Sweden, 2013) and so, too, has industrial development in the Swedish countryside (Furberg, Evengard & Nilsson, 2011). This explains the diminishing availability of natural grazing lands. Without a variety of high-quality and undisturbed areas in which reindeer can graze, no amount of legislative provisions will protect reindeer herders' livelihoods. Furthermore, the Environmental Code and certain forest certification programs encourage and require consultation with reindeer herders prior to the commencement of major projects (Government of Sweden, 1998; Sandström et al., 2003), yet it is not always required that the reindeer herders' recommendations be implemented, which explains the level of frustration respondents expressed.

The final indicator of institutional capital considered in this study was the availability of communications services. This is a particularly important consideration with regard to reindeer herding communities and other resource-based industries that involve the use of large areas of land, as it facilitates communications between workers. In reindeer herding communities, mobile phone service provides an opportunity to reduce costs that might otherwise be spent on the purchase of radios and other supplementary communications equipment. It may also make it possible for reindeer herders to be better aware of each other's locations and decrease response times in the event of injuries. Indeed, 17% of questionnaire respondents noted that the availability of mobile phone services made the work safer. When examining this indicator relative to itself in the mid-1980s, it is undeniable that great improvement has been made; mobile phone services were not widely available during the 1980s.

Still, this is not to say that mobile coverage is perfect in Sweden. As a country with a far greater population concentration in the South than in the North, coverage not equal when comparing different latitudes, as suggested by cellular coverage maps (http://www.cellmapper.net/map?MCC=240&MNC=5). Sweden's topography also varies quite widely between flat to swampy lowlands in the southeast and along the coast of the Baltic Sea, and mountainous regions to the west and north along the Norwegian border. Indeed, according to the National Post and Telecom Agency (2013), these are factors that can cause variability in mobile phone service, of which there is some clear evidence as reported by citizens in rural, northwestern areas (Kaliber Sjödell, 2013). Variability in mobile phone services influences reindeer herders disproportionately more than the average Swede, as reindeer herding lands are concentrated to the north and west of Sweden. Still, data obtained by the National Post and Telecom agency suggests that as many as 9 in 10 Swedes are satisfied with cellular coverage overall (Fransén, 2013). A summary of the findings regarding indicators of institutional capital can be found in Table 5.4.

Table 5.4 - Summary of Contributions to Adaptive Capacity from Institutional Capital

Type of capital	**Indicator**	**Impact of Indicator on Adaptive Capacity within Sample**	**Change since 1986 (as known)**
Institutional	Political action	-	↑
	Legislation governing reindeer herding	-	↓
	Communications services	+	↑

5.2.5: Contributions from Indicators of Natural Capital

Natural capital denotes the supply of available materials and information existing in the natural environment (Costanza et al., 1997). For the purposes of this study, the indicators of natural capital considered were available forest reserve, climatic variation and the prevalence of predation impacting reindeer herds. Natural capital with regard to reindeer herding communities is a very important consideration by virtue of the fact that reindeer herding requires large areas of land in order for the animals to follow natural migration patterns as well as a great deal of healthy vegetation on which they can feed. With regard to the indicators of natural capital considered in this study, it appears to be very much in decline. The measurement of available forest reserve as an indication of natural capital as expressed by lower food availability and decreased forested area have a negative impact on adaptive capacity in this regard. This can be explained, as stated above, as a side-effect of increasing population and development in Sweden over the last several decades. Pressures on reindeer herding pastures do not stand to lessen in the coming years, and may in fact be compounded by other factors, including the second indicator of natural capital that was considered, seasonal variation.

Respondents most often noted increased precipitation, warmer and longer autumns and warmer winters when asked about any changes to climate that they had noticed in the last few decades. These sentiments are congruent with the findings of the Swedish Commission on Climate and Vulnerability, which found in its 2007 report that an average annual increase in temperature of more than 1˚C was observed when comparing data from the period 1991-2005 with that of 1960-1991, particularly during winter months. It also found higher precipitation rates during all seasons except for autumn (Swedish Commission on Climate and Vulnerability, 2007). It is important to note that that this awareness of the changes taking place among reindeer herders represents a certain amount of power when facing these changes; the concept of change is by no means new, and understanding such changes allows reindeer herders to mobilize the effective coping strategies of the past. Indeed, as noted by Brannlund and Axelsson (2011), environmental variability has always been a reality of the pastoralist. While today's climate change reality may represent an extreme scenario when compared with the slightly colder winters or warmer summers of generations ago, reindeer herders' persistence indicates that adaptation strategies abound among them.

The increase in predation noted by respondents since the mid-1980s further illustrates the strong connection between natural and institutional capital where it concerns reindeer herders in Sweden. The Reindeer Husbandry Act recognizes the right of reindeer herders to hunt within their reindeer herding district, as well as the right to hunt within other reindeer herding districts in which they may be staying, though only for subsistence purposes in the latter. Still, it also states that the government reserves the right to limit hunting of predators, particularly in cases where populations are threatened, as conservation takes precedence over these rights (Government of Sweden, 1971). Where predators are concerned, specifically, the Swedish government mandates an annual cull of bears and lynx, as a means of population control, based on the previous year's population estimates of each species (Hommen, 2014). As such, licenses may be obtained to hunt these animals, and this could be seen as a positive occurrence toward limiting the influence of predation on reindeer herds. Where is concerns wolves and wolverines, two more species of concern to reindeer predation, hunting and culling are prohibited under the EU Habitats Directive. Wolf culling took place during 2010 and 2011 but has not since in order to ensure adherence to EU regulations, though a special cull was slated to take place in 2014 in certain areas due to population concerns (Hommen, 2014).

Despite efforts on the part of the Swedish government to monitor and control populations, the problem remains that predation is high. In the event that reindeer herders should notice a particular predator preying upon their reindeer, their options are very limited. Where bears and lynx are concerned, if herders have procured a hunting license for a cull that is ongoing, then the problem is easily solved. If, however, the predator is a wolf or wolverine, or a bear or lynx not during a cull, the process of protecting their property becomes complicated. The Hunting Act requires that in these circumstances, a special license be obtained to dispose of problem animals, and these are only granted if all other reasonable means of deterrence are exhausted (Government of Sweden, 1987). If reindeer herders are to obey the law then, they must submit documentation and wait for the bureaucratic process to unfold, as they watch their livelihood be consumed before their eyes. Furthermore, a "reasonable means of deterrence," as selected by the Swedish Environmental Protection Agency, has proven to be rather extreme at times. A particularly controversial and recent case involved a single she-wolf, on which the EPA spent more than $1.2 million CAD since November 2012 to keep alive, according to a press release by the Swedish Carnivore Association (2013). Expenditures went toward compensating

reindeer herders for lost livestock, moving reindeer away from the wolf's territory, supplementary feeding of reindeer, and for the sedation and transport of the wolf itself, which continued to take place after the expense report was released, a reported 4 total times between 2011 and 2013 (Swedish Carnivore Association, 2013b).

It is true that the Swedish Government recognizes the problem associated with high predation and lost livestock. As a result, it provides compensation for any reindeer killed by predators. Still, there is evidence to suggest that this is less than ideal from the standpoint of reindeer herders. Despite monetary compensation, the loss of genetic material contained within animals can result in the collapse of a herd, should predation reach a critical point of about 22% (Sami Parliament, 2014c). One interviewee expressed that monetary compensation, while a nice gesture, is not enough. It is very difficult to continue to develop a healthy herd when predation remains so high.

Yet another factor influencing predation is the aforementioned growth in population and industrial development of Sweden's wild areas traditionally used for reindeer herding. The well-documented impacts of the forestry industry in Sweden on the amount and quality of grazing land (Kivinen et al., 2010; Roturier & Roué, 2009; Bostedt, 2005; Eriksson et al., 1987 and others) as well as the compounding effects of other growing industries such as hydroelectric projects, wind farms, mines, roads and tourism serve to greatly diminish the available landscape for grazing (Furberg, Evengard & Nilsson, 2011). As mentioned in section 4.5.1, there has been a marked loss in productive forest in Sweden over the last few decades. Still, the loss of 133,000 hectares of productive forest is not the sole problem, and in fact only accounts for a loss of about 0.57% of the total forested land. The greater problem is the continued fragmentation of the landscape used for reindeer herding by industry, tourism and transportation infrastructures. While this is an area in which research is only in its infancy, reindeer herders have indicated that while certain forms of industry may have relatively small footprints, reindeer may be very sensitive to even the smallest disturbance or the presence of people, causing them then to avoid large areas around them. A little-considered side-effect of this phenomenon, however, is the impact of these modern developments on the amount of land available for predator habitat. Reindeer and their predators, after all, rely on the same natural spaces for survival. As a result, the predation problem for reindeer herders becomes three-fold: 1) some predator populations are increasing, 2) herders have fewer rights than ever in protecting their herds from predation, and 3)

the land area within which reindeer and predators cohabitate is decreasing, making it much easier for predators to find their prey. A summary of the contributions to adaptive capacity from natural capital can be found in Table 5.5.

Table 5.5 - Summary of Contributions to Adaptive Capacity from Natural Capital

Type of capital	Indicator	Impact of Indicator on Adaptive Capacity within Sample	Change since 1986 (as known)
Natural	Forest Reserve	-	↓
	Seasonal variation	-	↓
	Predation	-	↓

5.2.6: Contributions from Indicators of Economic Capital

Economic capital can be expressed in terms of monetary income and assets with a monetary value (Anheier et al., 1995). For this assessment, the indicators of economic capital used were employment levels and opportunities, as well as economic assets. Economic capital is essential in reindeer herding communities today. The modernization of the industry demands high financial inputs in order to successfully adapt to the aforementioned increases in competition with other land users, compounded by dynamic climatic conditions. In this regard, economic capital can be considered moderate to high in Swedish reindeer herding communities. Important indicators include the tendency of respondents to hold more forms of employment in the most recent year than in 1986 and the trend toward lower percentages of household income derived from reindeer herding during the same period. While herding is becoming less financially sustainable for most as a sole source of income, its value as a socially and culturally fulfilling way of life warrants effort on the part of herders to seek other means of financial sustenance.

Further proof of the alternative value inherent in reindeer herding is the trend toward increased subsistence from reindeer meat observed in the sample since 1986. The same increases in population and industry that have so negatively impacted institutional and natural capital among reindeer herding communities have also made alternative food sources more readily available over the last few decades. Herders and other rural-dwelling Swedes therefore have more choice when it comes to diet. There have long been those reindeer herders who focused on subsistence, as noted by Riseth et al. (2006), yet the increase in subsistence harvesting of reindeer in the sample may indicate that an adaptive paradigm shift is taking place in favour of

reindeer herding as a subsistence activity, rather than a for-profit economic enterprise. An interesting finding related to this is the record high values reindeer products are experiencing in the Swedish market. Prices may continue to rise in tandem with demands for local, sustainably produced food sources. Still, the limiting factors stemming from institutional and natural capital available to reindeer herders may demand that the trade in reindeer products remain a relatively small niche market.

A final indicator of economic capital that was explored in relation to reindeer herders was economic assets, expressed in terms of the types of equipment used in each household to facilitate pastoralist activities as well as income levels, although data could only be collected relating to Vilhelmina North and South districts for the latter indicator. Overall, reindeer herders have very much kept up with the modernization of Swedish society in their work, so the use of many forms of equipment, such as snowmobiles, All-Terrain Vehicles, and other motor vehicles, is commonplace (Utsi et al., 2005). This was reflected in the sample, and has both a positive and negative impact on the adaptive capacity of reindeer herding communities. Modernization is necessary, as herders struggle to keep up with development in their traditional grazing lands: smaller, more fragmented landscapes necessitate the ability to move herds quickly (Utsi et al., 2005), and multiple forms of employment require a much faster pace of work. As such, the use of modern technologies and the familiarization within communities of their repair and maintenance is an excellent adaptation to changing circumstances surrounding reindeer husbandry. Still, the modern technologies required are expensive and, although they represent valuable economic assets to the work of reindeer herding, they are depreciating assets, and therefore do not represent investments with good growth opportunities. In this respect, modern technologies are tools that require constant cash and time inputs to maintain, and therefore negatively influence economic capital. Furthermore, as more and more grazing areas are likely to be occupied or otherwise altered by industry, reliance on expensive equipment is likely to remain high or increase in the future. Still, there is no question that the use of these technologies has increased in the last several decades and has provided reindeer herders with an adaptive tool for the continuation of their way of life.

An examination of income amongst herders in the Vilhelmina North and South districts revealed that the average income amongst the herders from all forms of employment in these areas was $22,262.80 CAD. When compared with the Swedish average of 48,527.94 CAD

(Statistics Sweden, 2014c) it appears at first that herders may be struggling within their current livelihood to achieve economic stability. However, as herding is an entrepreneurial endeavor, all business expenses, which are significant in the herding industry, are thus deducted from herders' taxable incomes, and herders are also subject to an additional 25% reduction of their taxable incomes after these deductions (Service Administrator for the National Tax Service Vilhelmina Office, Mats Johansson, April 4, 2014). Therefore, reliance solely on these numbers would be misleading. Furthermore, the aforementioned personal and cultural significance of the reindeer herding livelihood must be underlined with regard to this point. As suggested in Chapter 1 and illustrated in Figure 1.1, herding is not merely a means of economic participation. It encompasses much more than that in the eyes of most of those who pursue it. Reindeer herders do not necessarily seek means of employment with the hope of gaining economic success; while more typical "Swedish" jobs may provide better compensation, reindeer herding provides a way of life.

An examination of gender with regard to income supports discussion surrounding the division of labour in reindeer herding households. Women in the Vilhelmina regions reported much higher incomes than men on average, however men take a higher proportion of their personal income from entrepreneurial activities. This indicates that, as stated by interviewees (See quotes in section 4.3), while men spend the most time overall working with the reindeer and directly related activities, this allows women more time for education and the pursuit of more typical "Swedish" forms of employment. Whether women have higher incomes before tax deductions is harder to ascertain. When considering the number of jobs held by women and men in the average year, men tended to have 4 or more, while women more commonly had 2 or 3. This may be a reflection of the kinds of tasks they undertake in their communities. The field work undertaken by men may lend itself more easily to several forms of seasonal work. Women, in turn, as those who tend to rear children and participate in their education, may not have time for as many forms of employment as men. Overall, these represent a clear example of different, yet equally important, roles played by men and women in herding communities. Table 5.6 provides a summary of the contributions of economic capital to adaptive capacity.

Table 5.6 – Summary of Contributions to Adaptive Capacity from Economic Capital

Type of capital	Indicator	Impact of Indicator on Adaptive Capacity within Sample	Change since 1986 (as known)
Economic	Employment levels and opportunities	+	↑
	Economic Assets	+/-	↑

5.3: Summary of Contributions to Adaptive Capacity

A more general assessment of the different forms of capital considered in this study and their contributions to the adaptive capacity of reindeer herding communities reveals that there are obvious areas of strength and others of relative weakness. The most positive contributions are derived from the area of cultural capital, where the indicators considered point to communities with strong cultural traditions that are well in the process of recovering from hindering influence of assimilatory strategies that that had been in place only a few decades ago. Cultural capital relates directly to social capital where it involves community attachment - strong cultural traditions positively influence community attachment and engagement, which in turn provides an avenue for increasing the strength of cultural traditions. Where indigenous populations are concerned, a wealth of traditional knowledge can facilitate the creation of adaptation strategies, as noted by Klenk et al. (2011). However, social capital is not as strong overall as a result of the perception of inequality amongst respondents as well as the relative lack of women in reindeer herding, which may point to gender inequality and unused intellectual potential of women in the field. Economic capital makes strong contributions to adaptive capacity as well, but only if the traditional Western paradigm of wealth is disregarded to a degree and the linkages between reindeer herding as an economic and cultural enterprise are more heavily weighted. Traditional economic theory would maintain that that the need for multiple forms of employment and relatively low incomes denote economic vulnerability, however, in the context of reindeer herding communities, this does not necessarily hold up. Multiple forms of employment could also be considered an adaptation strategy, and comparatively low incomes become less 'tragic' when the culturally fulfilling nature and semi-subsistence structure of herding are examined. Finally, human capital also makes strong contributions to adaptive capacity in this case. Though

education levels remain lower than the national average, there is strong evidence to suggest that they have risen a great deal in the last few decades and will continue to do so.

When considering relative weaknesses in contributions to adaptive capacity, we see that reindeer herders rate institutional and natural capitals relatively lower than social, cultural, economic, and human. Natural and institutional forms of capital, as mentioned above in their respective assessments, are highly interrelated, particularly where it concerns legislation, political power, available forest reserve and predation. As previously noted, the Reindeer Husbandry Act (1971) recognizes the rights of reindeer herders to use the land as a result of their occupation of it since time immemorial, therefore, herders may use about 55% of the Swedish landscape for the purposes of pastoralism and subsistence, including private land. Still, this form of property rights equates in practice to their existence as merely authorized land users. The Sami do not own the large tracts of land they require, and therefore, they do not have the right to intervene in activities that might impede their ability to benefit from its use. Furthermore, other pieces of legislation obstruct their ability to protect their animal property (reindeer) from predators. Their limited political power within the country as a whole and the fact that they do not represent a significant industry with the ability to create large economic inputs in Sweden leave their success as reindeer herders at the mercy of these challenges. Finally, it should be noted that no significant reference was made overall on the part of the respondents to the Chernobyl disaster. Therefore, while 1986 serves as a useful reference point for understanding adaptive capacity, the data show that it no longer figures prominently as an impediment to the adaptive capacity of reindeer herding communities overall. Table 5.7 summarizes the contributions made to adaptive capacity by the respective forms of capital considered in this study and lists them by the significance of their contribution to adaptive capacity overall.

Table 5.7 – Summary of Contributions to Adaptive Capacity

Type of capital	Indicator	Impact on Adaptive Capacity	Change since 1986 (as known)
Cultural	Indigenous ancestry	+	
	Indigenous language proficiency	+	↑
	Participation in cultural activities	+	↓
Economic	Employment levels and opportunities	+	↑
	Economic Assets	+/-	↑
Human	Experience and training	+	
	Education levels	-	↑
	Languages	+	
Social	Age	+	
	Gender	+/-	
	Community attachment/ engagement	+	
	Equality	-	↑
Institutional	Political action	-	↑
	Legislation governing reindeer herding	-	
	Communications services	+	↑
Natural	Forest Reserve	-	↓
	Seasonal variation	-	↓
	Predation	-	↓

In summary, the interrelation between institutional and natural capital is the principal challenge to the adaptation of reindeer herding communities. Still, the problem areas that exist between these areas and those related to other forms of capital are not acute. Indeed, though institutional and natural capital do not make the strongest contributions to AC overall, there are tools in place that stand to improve these areas in the future. The Sami Parliament and Reindeer Herding Plans, for example, both present institutional tools through which reindeer herders are being empowered to have a more equal voice amongst competing industries for mutually beneficial and sustainable use of the land. Finally, the strength of indicators related to cultural, economic and human capital indicate that reindeer herders are actively engaged in their adaptation to the dynamic environmental and societal conditions they face on a day-to-day basis.

5.4: Gendered Contributions to Adaptive Capacity

Significant differences were found between the contributions of male and female reindeer herders to adaptive capacity where it concerns social, human, cultural and economic capitals. These findings are not altogether surprising; Kuokkanen (2009), for example, previously noted that women and men specialized in different tasks prior to the period of Swedish assimilatory policies enforced upon the Sami for the better part of the last two centuries. This insight was echoed in the findings of the present study with regard to cultural capital, where it was found that men tended to spend the most time in the field with the reindeer herds, while women are most present overall during the busiest times of year. These periods include early summer, when the newborn calves are given earmarks representing their ownership, the busiest migration times for the herds, and during slaughter.

Women's roles in the rearing of children, the production of handicrafts for sale and as the most prevalent language users are also important roles to note. As noted by Kvernmo & Heyerdahl (2004), indigenous language has shown to be strongly linked with cultural identity among Sami. Traditional knowledge policy documents produced by the Sami Parliament stress the importance of languages as a means of retaining traditional knowledge, as these languages were "developed in the conditions that [their] ancestors lived in, and on the basis of the activities they undertook" (Sami Parliament, 2010). Sami languages are therefore inextricably tied to the land, reindeer and daily interactions with both. The production of traditional handicrafts is also of great importance, not only because many of these items are used in practical ways during reindeer herding activities (such as traditional Sami knives), but they also represent a secondary source of income and a means of further capturing and maintaining traditional knowledge in reindeer herding communities. Women, then, carry a proportionately larger role in maintaining traditional knowledge in the form of language and saleable handicrafts, and in transferring this knowledge to the next generation of reindeer herders through child rearing activities. Men generally play the invaluable role of working in the field, gathering knowledge of the reindeer, landscape and natural environment. These roles tend to require physical strength and skill for handling of reindeer, as well as technical knowledge for the use and maintenance of equipment used therein. Both sets of knowledge are required for the maintenance of the reindeer herding way of life.

Given the prevalence of men when it comes to working in the field amongst the reindeer, it is not surprising that in measuring social capital, women tended to respond more negatively than men in the sample regarding equal access to employment in reindeer herding. Indeed, as previously noted, according to Sami Parliament Statistics, 85% of active reindeer herders are men (Sami Parliament, 2009). Yet such statistics may be misleading; it is not clear by what measure a person is determined to be a reindeer herder. Surely it cannot be determined on the basis of spending the majority of one's time in the field, as reindeer herding is a labour-intensive practice requiring many hands to succeed. One young woman captured this point very well in her interview: "…And what's counted as a reindeer herder? It's most of the things that the men do. And today, I think, reindeer herding is many things. So also it is to learn children and take care of the language – that kind of stuff could be a part of reindeer herding." (Woman, 18-34)

Furthermore, the results of the present study demonstrate that women are, in fact, present, and often engaged in logistic or otherwise supportive activities that contribute to the successes of their husbands, fathers and brothers in the field. The question of "What makes a reindeer herder?" is likely to become one that requires more attention in the near future. In particular, the spread of the latest technologies to reindeer herding communities may in fact increase women's participation: In their study, Andersson and Keskitalo (2012) found that the use of GPS technologies for tracking reindeer had the effect of increasing involvement of women who spent more time at home, but could see the reindeer's movements on their computer screen. Further, they found evidence to suggest that women may have more developed computer skills, making their involvement more important as the use of such technology continues.

Still, the results of the present study suggest inequality of inheritance when it comes to reindeer herding businesses, as was present in the finding that 30% of respondents with both male and female offspring believed their sons would inherit the business, 45% said both, and only 5% said their daughters would inherit. A previous study by Lidestav (2010), indicates that this phenomenon is not only present within reindeer herding communities, but in Swedish families engaged in forestry. As such, this result is indicative of a larger trend of inequity in traditional land and family-based enterprises in Sweden.

The inequalities observed between men and women regarding the division of labour and inheritance help to explain the observed differences between genders where institutional capital was concerned. Women noted less awareness of legislation affecting their reindeer herding

enterprises as well as decreased participation in Reindeer Husbandry Plans as compared to their male counterparts. It is possible that the "macho" environment within which reindeer herding takes place leaves women less interested in contributing to institutions influencing reindeer herders because this is seen as a responsibility that is reserved for men in higher proportion. Further, RHPs may focus on the aspects of reindeer husbandry that are more central to its existence as a business enterprise, rather than the larger functional levels that exist within it including as a family practice and a cultural tradition, as illustrated in Figure 1.1, and therefore do not focus on the supportive activities in which women are more often present. Still, given the tendency of women to seek formal education at a greater rate than men, it is possible that women will become more engaged in areas contributing to institutional capital, with RHPs, or at higher levels of government.

Perhaps the most compelling of figures derived from the results of the present study is the drastic dichotomy existing in the sample with regard to the gendering of education. In this instance, the dominance of men in the field provides proportionately higher opportunities to women than men and may negatively impact the personal resilience of men participating in reindeer herding economies. As was also observed in the sample, pursuing reindeer herding often requires that herders take on multiple other sources of income in order to support their way of life as well as themselves and their families. As men are much less likely to pursue tertiary education and often find employment in other resource-based industries, they may be more vulnerable to changing economic and climatic conditions that directly impact these industries and less qualified to seek other forms of employment in such cases. This point is further supported by the higher average income of women in Vilhelmina North and South districts, and may also explain the higher overall language proficiency found among women when compared with men. These facts all point to the conclusion that women have a higher level of personal resilience than men, particularly in a larger context, beyond reindeer herding communities. They may not tend to possess as many of the practical pastoralist skills as men and therefore seem disadvantaged in power systems surrounding reindeer herding, yet they possess skills and human capital which may translate into greater power within or outside of their communities in the future.

Yet another dimension of the relationship between gender and adaptive capacity that the present study brings to light is the fact that the forms of capital in which differences between

men and women were most prevalent were also the areas that contributed most positively to community adaptive capacity overall, namely cultural, economic, human and social capitals. As such, it is possible to regard the present division of labour as an adaptation to the modern realities of reindeer husbandry. As it grows more difficult to survive financially on reindeer herding alone, given modern pressures such as climatic variations, habitat fragmentation and legislation, reindeer herding families have adapted with a set of cultural norms that allow for half of community members to seek education and high monetary recompense for employment. The other half tends to the culturally fulfilling practice of reindeer husbandry and, in the end, all may benefit from both. This division of labour happens to take place on the basis of gender, which may negatively impact individuals. Still, at the community level, the result presents as two halves working toward a well-adapted whole. This phenomenon does not necessarily take place within a 'traditional' family unit, where a mother rears children and works while a father tends to the family's reindeer herd. It may also take place in cases where a young woman's father or brother tends to the reindeer she owns while she is away at school, or within other examples of male-female relationships in reindeer herding communities. However, it does raise the issue that, at the level of the family unit, reindeer herding is supported through a differential division of labour among contributing parties.

In summary, while reindeer herding appears to be a male-dominated industry on the surface, the reality within communities is much more complex. Not only are both women and men present and active in the industry, their respective roles are invaluable to its success. While gendered contributions to each of the indicators of adaptive capacity used in the present study are not always fixed or obvious, there are key areas in which the trends cannot be ignored. Further, these differences may provide insight into better targets for increasing capacity in the areas that displayed relative weakness. For example, encouraging women to engage in Reindeer Herding Plans may increase institutional capital amongst reindeer herding communities. Likewise, encouraging men to seek higher education at a greater rate would increase human capital directly, as well as potentially economic capital by making men more qualified for employment outside of reindeer herding with better compensation.

While the present study focusses on community adaptive capacity and gendered contributions therein, it is important to note the implications of its findings with regard to the personal resilience of individuals within them. The persistence of a division of labour within

reindeer herding communities that reinforces fieldwork as a masculine endeavour means that women may be disenfranchised and under-valued in the roles they do play as reindeer herders. Further, the personal resilience of men may be negatively affected, particularly when considering that there is a certain degree of expectation that they will carry on the reindeer herding business from their parents, which has the effect of dissuading them from pursuing higher education. In the event that their reindeer herding enterprise fails, then, men are disproportionately disadvantaged by the current state of affairs, as they lack the training to easily find employment elsewhere. Indeed, modern gender discourse has begun to explore the influence of male-female power dynamics and their impact, not only on the disenfranchised, but the privileged as well (e.g., Monk, 2011; Butt et al., 2004; Kaufman, 1999; Pleck, 1984). The systems of power and privilege that exist between men and women may, at first glance, seem to entirely serve men and marginalize women, but power and privilege can serve as double-edged swords. To maintain their status and fulfill the role of the man comes with just as many limits and expectations. In the example of reindeer herding communities, women might be expected to achieve education, gainful employment and eventually find a partner to settle down and support her reindeer herding husband. Men on the other hand, may be expected to begin working in the field as soon as possible, become adept at fixing machinery and wrestling reindeer, and spend much of their lives away from their families. Can't the opposite be acceptable as well? Surely, societally-based gender norms and pressures have greatly improved in the past several decades, but they still exist. As such, it is important to understand how these norms impact the lives of men and women respectively. In turn, an understanding of the gendered impact on community adaptive capacity may provide insights that lead to more adaptive, sustainable communities in the future.

6: CONCLUSION

6.1: Summary of Findings and Recommendations

This study was born out of the need for more research relating to the adaptive capacity of Swedish reindeer herding communities in light of climate and other changes affecting the circumpolar north. The northern geographic location of Swedish reindeer herders alone represents a potential challenge with regard to adaptation as the results of climate change begin to have the most tangible effect on circumpolar areas. This is compounded by economic concerns stemming from the pursuit of the traditional practice of reindeer herding, which is inextricably tied to the surrounding environment. Another area for consideration lies within the dynamic social milieu of reindeer herders and Swedish Sami in general, resulting from hundreds of years of assimilatory policies that have only been repealed in favour of more protective ones in the last few decades. With an understanding of these factors, three questions were posed by this study:

1. What is the current status of adaptive capacity in Swedish reindeer herding communities and how has it changed in the last few decades?
2. How do men and women contribute respectively to the adaptive capacity of Swedish reindeer herding communities overall?
3. What changes can be made to policy and practice in order to increase adaptive capacity of reindeer herding communities and in which areas is a gender-sensitive approach likely to increase the success of these measures?

With regard to the first research question, among the six forms of capital considered (social, human, cultural, economic, natural and institutional), there were areas of strength in adaptive capacity as well as those of relative weakness. Cultural capital was the area in which indicators painted the most positive picture, due to strong cultural traditions and transference of indigenous knowledge, as well as a renaissance in popularity and social acceptance of education in traditional languages and practices. Economic capital was an area of strength as well. Although reindeer herders do not generally present as wealthy from a traditional or Western economic perspective, their willingness to pursue multiple forms of employment to support

reindeer herding as a way of life is a trait tied to the strength of cultural capital which bodes well for the long-term economic sustainability of their way of life. Human and social capitals were the next strongest areas. Both showed substantial growth over the time period being studied for comparison, and while some indicators of social capital had a negative net effect on adaptive capacity overall (gender distribution of the sample and perceptions of equality), the data demonstrate that a reversal has been taking place in these areas over time. The areas that demonstrated relative weakness in their contribution to the adaptive capacity of reindeer herding communities were institutional and natural capitals. The two areas are inextricably linked in this case, as institutional factors such as legislation determine how much natural capital is available for the use of reindeer herders and how it may be used. In turn, the status of natural capital in Sweden determines legislation that may aid or impede reindeer herders' work. These areas are also those over which the Sami have the least direct control as they are reliant on the favourable exercise of government at another level to address legislative and land-use conflicts/issues.

With regard to the second question, which seeks to understand the contributions of each gender to adaptive capacity, key differences were observed between men and women in the sample. When considering cultural capital, a divide was apparent in the types of cultural skills and knowledge employed by men and women. Where men generally employed physical and field skills, women employed those related to Sami language, subsistence support, child rearing and the production of handicrafts. Concerning economic capital, men tended to have more forms of employment during the year, but women tended to receive better compensation overall. This may be linked to their differences in human capital, as women sought post-secondary education at a much greater rate than men and may be qualified for forms of employment with better compensation as a result. With regard to social capital, inequality was observed between men and women where it concerned their presence in the sample and in reindeer herding as a whole. Women represented a smaller proportion of respondents (22%) and tended to specialize in roles that did not involve as much direct contact with reindeer in the field, although women's activities lent themselves to the overall success of reindeer herding enterprises. Clear differences existed between genders; each gender contributed invaluably to the process and livelihood of reindeer herding as a whole.

Returning to Figure 1.1, we can classify the contributions of each gender overall within the different functional levels of reindeer herding. Men, as stated above, spend the greatest amount

of time overall with the reindeer in the field, contributing landscape knowledge, physical strength and technical skills with regard to the maintenance of equipment. As such, their greatest contributions lie within the innermost functional level of reindeer herding, as an economic enterprise. Women, on the other hand, while contributing to this level as well, particularly during the busiest times of year, participate more often in the larger functional levels. As those who spend the most time child rearing and as sources of alternative income, they contribute to reindeer herding as a family practice. As those with the greatest proficiency in Sami languages and the strongest contribution to the sale of handicrafts, they promote the continuation of reindeer herding culture, and therefore contribute to reindeer herding as a livelihood.

Finally, the third question can be broken down into two parts: A) what changes can be made to policy and practice in order to increase adaptive capacity of reindeer herding communities and B) in which areas is a gender-sensitive approach likely to increase the success of these measures? To address the first part, a return to the analysis of the contributions of each of the different forms of capitals to adaptive capacity as a whole is required. In doing so, we see that cultural, economic, human and social capitals are all either faring well already or have shown improvement over the past three decades. Consequently, attention can be more practically paid to the forms of capital that showed relative weakness and regression: institutional and natural capitals. Here, we see that institutional devices in the form of legislation determine reindeer herders' access to natural capital. The Reindeer Husbandry Act (1971) authorizes reindeer herders as users of the land for traditional purposes. Yet this authority is limited legislatively to the 51 reindeer herding districts. Each reindeer herder may, in turn, belong to one of these areas, and is limited even within their district between summer and winter grazing lands. Therefore, their property rights are limited, as they do not equate to fee simple ownership. Within these areas, there are private landowners and industrial users. Although both are obligated to respect the rights of reindeer herders, their activity and growth have resulted in increasing limitations on the ease of access and utility of these lands for the purposes of reindeer herding and there is no strict adherence to practices that protect herders' interests. Meanwhile, these stressors to natural capital result in further legislation to protect biodiversity in the Swedish landscape. While the intention of such legislation may be to protect natural capital, such as in the case of legislation protecting predators, it may have the unintended consequence of weakening the rights of herders to protect their animal property.

Given these shortcomings, legislators from outside reindeer herding communities have the power to increase institutional and natural capitals within them by providing further special provisions for reindeer herders regarding the management of predatory species, by expediting the process of acquiring permits for hunting, and by requiring stricter adhesion to the requests of herders as vocalised in industry consultation processes. Additionally, if government agencies were able to offer opportunities for direct engagement and negotiation with reindeer herders and landowners about their concerns that complement those pre-existing ones (RHPs, for example), they may formulate integrative policies and legislation to address them. Reindeer herders, in turn, may benefit from greater participation in institutional devices available to them. Increasing voting in Swedish and Sami Parliament elections and continued participation in Reindeer Husbandry Plans may be key strategies. In particular, the Sami Parliament and Reindeer Herding Plans are tools that are still in a stage of relative infancy as institutional tools, and therefore, may have yet to reach their potential for increasing adaptive capacity in reindeer herding communities.

In considering the second part of this question, it must be noted that the areas in which adaptive capacity is relatively weakest in reindeer herding communities (institutional and natural capitals) were those where gendered differences in the dataset were the least pronounced. Indeed, the areas of cultural, economic, human and social capitals, where gender played the largest role in contributing to adaptive capacity, were those that had the most positive influence on adaptive capacity in reindeer herding communities overall. This is not necessarily an argument for maintaining the status quo where gender roles and relations are concerned. Rather, this result may reveal that the most pressing concerns for reindeer herding communities are the least affected by gender. It may also be a consequence of the progressive policies put into place by the Swedish government in the last several decades to improve gender equality. Still, the increased level of formal education among women in the sample may indicate that a shift could take place. It is possible that women may become more engaged in institutional tools available to them, including RHPs, local government and Sami Parliament. This would serve to shift power dynamics in reindeer herding communities, make women's roles more visible, and improve access to a greater pool of intellectual potential to address reindeer herders' relative weakness with regard to institutional and natural capital.

6.2: Deconstructing "Community": central contributions

The body of research regarding adaptive capacity at the community level has grown significantly in the last decade and includes studies ranging over several continents (Brown et al., 2010; Eakin, Lerner & Murtinho, 2010; Lopez-Marrero & Yarnal, 2010; Pearce et al., 2010; Nelson et al., 2008; Tyler et al., 2007; Wall & Marzall, 2006 and others). However, there is relatively little research on Swedish reindeer herders, who face a set of challenges with regard to changing climate, as well as dynamic social and economic conditions that are akin to other northern indigenous communities. As such, this study provides a better empirical understanding of the unique strengths and weaknesses possessed by Swedish reindeer herding communities with regard to adaptive capacity and seeks to contribute to the base of knowledge concerning community adaptive capacity, northern indigenous peoples, the Sami and Swedish reindeer herders in particular. Further, relatively few studies on the topic of adaptive capacity have considered the gendered issues involved in personal adaptive capacity or the contributions of gender to the adaptive capacity of communities overall. Instead, there is a tendency to treat communities as homogenous entities, with little attention paid to the sub-communities therein. By considering gender, this study challenges that practice and demonstrates that important differences can be found by analyzing data in such a way that compares and considers simple demographics within a sample.

This study has contributed a better empirical understanding of adaptive capacity in reindeer herding communities by applying variables for adaptive capacity used in other community contexts and adapting them to consider the specific realities of reindeer herders in Sweden. In doing so, areas of strength and relative weakness in adaptive capacity of reindeer herding communities were exposed. The results of this study may be used to inform policies and community practices designed to enhance the adaptive capacity of reindeer herders to environmental, social, economic, and institutional challenges they face.

By pursuing a methodology that segregated data by gender, this study challenges the predominant homogenous concept of community. The research explored the unique contributions of gender to adaptive capacity and, by examining the multiple layers of reindeer herding, it encouraged a new way of understanding the structure of the industry around which reindeer herding communities are organized. Returning to Figure 1.1, it is clear that gender may contribute to adaptive capacity in ways that are more apparent when considering the different

functional levels, or scales, of the reindeer herding industry. Women contribute proportionally more to reindeer herding as a family and community livelihood. Their efforts are therefore broader in nature and risk being disregarded if a broad conceptualization of reindeer husbandry is not used. Men contribute more specifically to reindeer herding as a business practice, and are, for that reason, more visible if a more narrow definition of reindeer herding is used. Therefore, this study calls for a broader conceptualization of the reindeer herding industry, and what it means to be a reindeer herder. Positive contributions to adaptive capacity, in this case, are not made solely on the bases of time spent in the field with reindeer. In fact, time spent away from the central focus of the industry contribute positively to the long-term success of a herding enterprise.

Finally, this research challenges the practice of disregarding gendered dimensions of environmental management and adaptive capacity in the context of communities in developed nations. Men and women continue to have different roles, identities and responsibilities within a reindeer herding unit and community. Understanding how these differences manifest themselves in a specific case are crucial when seeking an understanding of community adaptive capacity.

6.3: Limitations

There were several methodological and researcher-based limitations involved in this study. First, with regard to methodological limitations, a lack of previous statistical data available regarding reindeer herding communities, as well as previous studies more closely related to the subject of the present one, made creating a comparison by which to understand adaptive capacity difficult. Studies related to reindeer herders in general are relatively few, and tend to be concentrated in the health sciences. Furthermore, Statistics Sweden does not collect data pertaining to ethnicity, making it impossible to consider data related to reindeer herders as a subset of the population. To compensate for this, the questionnaire developed for the study was much longer than it might otherwise have been, which may in turn have discouraged participation and contributed to the second methodological limitation of the study – small sample size. While 270 households were sent questionnaires, only 63 responded. In addition to the fact that the questionnaire was long, its timing may also have been poor for reindeer herders. The questionnaires were mailed out in June and July of 2013 – months that were described anecdotally upon arrival in Sweden as the busiest of the year for reindeer herders, as reindeer are finishing their migration between winter and summer lands and the calving season is well

underway. Nevertheless, these months were the best suited for research as they coincided with the break between academic years in Canada. Another side-effect of the lack of prior research and statistical data regarding reindeer herding communities was the reliance on data that were largely self-reported. While respondents were notified that their responses would be kept confidential, the questionnaires were not anonymous, and therefore it is possible that the responses to some questions may not have been entirely accurate. To circumvent this possibility, questions that might be perceived as taboo were eliminated before the questionnaire was distributed with help from researchers at the Swedish University of Agricultural Sciences and Vilhelmina Model Forest (VMF) staff.

Finally, during the process of designing the study, it was decided that 1986 would be a good reference year for the study due to the fact that the Chernobyl disaster factored heavily into the daily lives of reindeer herders in the late 1980s, but little research had been done in the last several years that assessed the importance of its aftereffects at present. The results of the study demonstrated that, although some reindeer herders are still mitigating the effects of radiocaesium presence in food sources for reindeer, Chernobyl was no longer a top-of-mind concern for respondents. Although the length of time between the reference year and the present provided some stark and compelling contrast within the results, it served primarily as a limitation. Due to the nearly three decade time period that respondents were asked to assess, many were excluded by providing answer to some questions, due to their youth. Many were not born by 1986 and others simply had no memory of it.

There were also some researcher-related limitations present in the study. First, access to members of the community was limited to a certain extent by cultural and language barriers. As I am a Canadian female with little knowledge of the Swedish language, it was difficult at first to build a rapport with community members in an environment that is dominated by people (in particular men) who do not all have a working knowledge of English and tend to be apprehensive of outsiders. This was compounded by budgetary and timing considerations. Still, opportunities arose to accompany members of the VMF staff on field trips with reindeer herders, and the VMF staff. Additionally, colleagues from the Swedish University of Agricultural Sciences helped to limit these challenges by translating where possible and making introductions with community members.

6.4: Recommendations for Future Research

Given these limitations, a better understanding of the dynamics of reindeer herding communities could be gained through the exploration of other groups within them, such as reindeer herding districts, education level/type, family structure, etc. It must also be noted that while gender was treated as a somewhat homogenous category for the purposes of this study, this is not necessarily the case. Further research in this area might more closely examine the relationships of groups within (e.g., age) and between genders to better describe the subtleties that bear influence on their respective contributions to adaptive capacity.

In closing, this study found data indicating that reindeer herders demonstrate significant skill in adapting to a variety of conditions relating to the six forms of capital considered. They are, however, hindered by factors that are mostly beyond their immediate control where it concerns factors influencing the strength of institutional and natural capitals. Although they exhibit strength in other areas, all six forms of capital are inextricably linked. Therefore, it would be impossible for herding communities to achieve sustainability indefinitely unless positive strides are achieved in the areas of institutional and natural capital. Further, this is an area in which the gendered aspects of adaptive capacity observed in this study may play out to the benefit of reindeer herding communities. The strength of women with regard to human capital, in the form of education especially, may increase the influence of reindeer herders in Swedish institutions if they obtain powerful positions therein. For this to take place in the meantime, legislators and competing land users must gain a better understanding of the effects of their actions on reindeer herding communities. Reindeer herders, in turn, may be invited and choose to take a more active role in this process.

With regard to gender and its influence on adaptive capacity in Swedish reindeer herding communities, it is clear that male and female reindeer herders make different contributions to several forms of capital, and that these contributions complement each other, leading to strong adaptive capacity. Like elsewhere in the world, gender roles and relations continue to fluctuate within Swedish reindeer communities. Nevertheless, the differences found between men and women in this case offer new insights that may be useful for the creation of more efficient and targeted approaches to increasing adaptive capacity within Swedish reindeer herding communities and elsewhere.

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Appendix A – Questionnaire used for Data Collection

UNIVERSITY OF SASKATCHEWAN
School of Environment and Sustainability

SLU

SECTION 1:
The Influence of Gender on Adaptive Capacity:
A case study from a Swedish reindeer herding community

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Purpose and Objectives of the Research:
The purpose of the study is to assess the adaptive capacity of a Sami community facing environmental, social and economic challenges and discover how gender contributes to its adaptive capacity overall. The objectives are to:

- Determine key economic, social, and environmental changes affecting reindeer herders in Sweden
- Develop an analytical framework of adaptive capacity that is sensitive to gender differences
- Use the framework to analyze the contributions of men and women in relation to the adaptive capacity of their community as a whole
- Identify the meaning of adaptive capacity within the specific context of a reindeer herding community and options (if necessary) for strengthening its adaptive capacity with the use of strategies that take gender into account

Procedures:

The study will use a combination of document analysis, self-administered questionnaires and interviews to achieve the above objectives.

Potential Risks:
There are no known or anticipated risks to you by participating in this research

Potential Benefits:
The results of the research will be shared across many levels. Research results will be shared with the participating Sami community. Regionally, a better understanding of Sami people in the Vilhelmina region will contribute to effective management policies and provide recommendations for strengthening community adaptive capacity. The research findings will also contribute to the body of research available regarding the Sami people, may support the creation of policies and/or strategies that benefit the Sami and improve relations between Sami and other land users. The research will also provide a framework and an analytical process for considering how gender affects community adaptive capacity. In turn, these benefits may provide means of strengthening adaptive capacity within Sweden's Sami communities as well as others.

Confidentiality:
The data obtained via this questionnaire will be kept confidential. Only the researchers listed above will have access to the individual questionnaires. Information collected from individuals will be combined before results are shared. This means that it will not be possible to determine individual responses. There are therefore no risks to your confidentiality.

Right to Withdraw:
Your participation is voluntary and you can answer only those questions that you are comfortable with. You may withdraw from the research project for any reason, without explanation or penalty of any sort, until such time as the data are analyzed and a report is completed. If you wish to withdraw, please contact Gun Lidestav (contact information above).

Questions or Concerns, Follow-up:
- To obtain the results of the study, or for any other questions or concerns, contact the researcher using the information at the top of page 1;
- This research project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office ethics.office@usask.ca (306) 966-2975. Out of town participants may call toll free (888) 966-2975.

By completing and submitting the questionnaire, YOUR FREE AND INFORMED CONSENT IS IMPLIED and indicates that you understand the above conditions of participation in this study.

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Instructions:
One questionnaire is to be completed by each adult living in your household, but no one under the age of 18. It should take you no more than 30 minutes. You may choose not to answer any questions with which you do not feel comfortable.

Thank you for taking the time to share your views with us,

Astri Buchanan, Master of Environment and Sustainability Candidate,
University of Saskatchewan

Hanna Vestman, Master's student in Forest Management,
Swedish University of Agricultural Sciences

Section 1A: Institutional variables contributing to adaptation

1. How would you describe your habits when it comes to voting in local, regional and national government elections? (Circle the best answer)

   Never vote Almost never vote Vote sometimes Usually vote Always vote

2. How has this tendency changed since about 1986? (Circle best answer)

   Vote less often No change Vote more often Not applicable

3. How would you describe your habits when it comes to voting in Sami elections? (Circle the best answer)

   Never vote Almost never vote Vote sometimes Usually vote Always vote

4. Are you aware of legislation governing reindeer herding activities?

   ☐ YES ☐ NO

5. If yes, what legislation(s) govern your activities, whether directly or indirectly related to herding?

   _____

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6. Describe how this legislation may help or hinder reindeer herding activities, to your knowledge and experience:

_____

_____

_____

_____

7. Have there been any major changes to the effect of legislation on herding activities since around 1986, to your knowledge and experience? If so, please specify:

_____

_____

_____

_____

8. If you answered "YES" to question 4, do you feel that the current legislation adequately protects your right to reindeer herding? Circle the best answer.

Very inadequate	Somewhat inadequate	Neutral	Somewhat adequate	Very adequate

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Section 1B: Economic variables contributing to adaptation

1. Describe your role in your household (check all that apply).

☐ Primary wage earner ☐ Other (Please specify)

☐ Secondary wage earner _____

☐ Homemaker ☐ Other (Please specify)

☐ Dependent _____

2. How many different sources of income did you have:

In the last year?:

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ more than 3

In 1986?:

☐ Not applicable

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ more than 3

3. Please list the sources of income you had in the last year.

1)_____ 4)_____

2)_____ 5)_____

3)_____ 6)_____

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4. Please check the appropriate boxes to indicate who takes part in each activity in your household.

Reindeer husbandry activity	I take part	My spouse/partner takes part	My (Check one): ☐Son ☐Daughter ☐Other: _____	My (Check one): ☐Son ☐Daughter ☐Other: _____	My (Check one): ☐Son ☐Daughter ☐Other: _____
Calf marking (kalvmärkning)					
Gathering for separation					
Separation					
Moving the herd and equipment needed					
Feeding in the field					
Fencing work					
Coordination of common activities for the reindeer herding district (samebyns)					
Administration of own enterprise (e.g. book-keeping, tax declaration)					
Meetings/consultancy with other land users (samråd)					
Teaching / training others					
Slaughtering					
Food processing for household consumption					
Food processing for sale					
Hunting					
Fishing					

Fuelwood preparation					
Gathering of berries, mushrooms and wild plants					
Food processing for household consumption					
Food processing for sale					
Handicraft for household consumption					
Handicraft for sale					
Other (please specify) _____					
Other (please specify) _____					

5. How much of your household's total income is derived from reindeer herding? Circle the appropriate answer)

In the last year:

☐ 25% or less ☐26%-50% ☐51%-75% ☐ 76%-100%

In 1986:

Not applicable ☐ 25% or less ☐26%-50% ☐51%-75% ☐ 76%-100%

6. Of the reindeer harvested each year, how much is for household consumption?

   In the last year: _____ %

   In 1986 : _____%

7. In the following table, please list the kinds of equipment that your household uses for reindeer herding (for example, snow mobiles, trailers, GPS, etc.) and the members of the household that use it by checking all those that apply.

Equipment type (please list)	**Member(s) of household that use the equipment (check where applicable)**							
	YOU	☐ Your spouse	☐Child #1 ☐Male ☐Female	☐ Child #2 ☐Male ☐Female	☐Child #3 ☐Male ☐Female	☐Child #4 ☐Male ☐Female	☐Other (Specify) _____	☐Other (Specify) _____

8. How does the above equipment affect your success in herding?

   _____

   _____

   _____

   _____

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9. Can you describe any specific effects that technology used in herding has had on your household or community?

_____

_____

_____

_____

Section 1C: Natural variables contributing to adaptation

1. How would you describe the availability of natural foods (e.g., lichen) for your reindeer over the last year? Circle the best answer.

Very low Low Same as always Better Much better

2. How often have you provided supplementary food to your reindeer in the past year?

Always Often Sometimes Almost never Never

3. When you do provide supplementary food to your reindeer, what is the reason? (Check all that apply)

☐ Periods of famine
☐ Reindeer are migrating
☐ To fatten reindeer before slaughter
☐ To render meat suitable for human consumption
☐ Other: _____
☐ Other: _____

4. How would you describe the availability of natural foods (e.g., lichen) for your reindeer in the year 1986? Circle the best answer.

☐ Not applicable

Very low Low Same Better Much better

5. How often did you provide supplementary food to your reindeer during the year 1986?

Always Often Sometimes Almost never Never Not Applicable

6. What would the reason have been at that time? (Check all that apply)

☐ Not applicable
☐ Periods of famine
☐ Reindeer are migrating
☐ To fatten reindeer before slaughter
☐ To render meat suitable for human consumption
☐ Other: _____
☐ Other: _____

7. Have you noticed changes to the climate in your sameby since 1986?

☐ YES ☐ NO

8. If you answered "YES" to #7, please describe these changes:

_____

_____

_____

_____

_____

9. What percentage of your heard is lost to predators?

This year: _____%

10. In the year 1986: _____What percentage of your heard is lost due to traffic accidents?

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This year: _____%

In the year 1986: _____%

Section 1D: Human variables contributing to adaptation

1. What is your **highest** level of education completed? (Check the best answer)
   - ☐ Elementary School
   - ☐ Secondary School
   - ☐ College Diploma
   - ☐ Some university
   - ☐ Undergraduate degree
   - ☐ Graduate school
   - ☐ Doctorate level or higher

2. Do you believe that you might face any barriers when it comes to attaining a higher level of education?

   ☐ YES ☐ NO

3. If you answered "YES" to #2, please explain:

   _____

   _____

   _____

   _____

4. How have you learned about Sami culture and reindeer husbandry (check all that apply)?
   - ☐ Sami Elementary School
   - ☐ Sami Integrated School
   - ☐ Reindeer husbandry course
   - ☐ Samernas folk high school in Jokkmokk
   - ☐ Sami university courses
   - ☐ From your family
   - ☐ By practicing reindeer husbandry for _____ years

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☐ Other (please specify): _____

Section 1E: Cultural variables contributing to adaptive capacity

1. Have you always been involved in reindeer herding?

   ☐ YES ☐ NO

2. If you answered "NO" to the above question, how long have you been active in reindeer herding activities?

   _____ years

3. Indicate your proficiency in the following languages by checking all that apply, and specify any others you are familiar with.

Language	Read	Speak	Write
Swedish			
Any Sami language			
English			
Other: _____			
Other: _____			

Section 1F: Social variables contributing to adaptation

1. Please indicate, by circling the appropriate response, to what degree you agree or disagree with the following statements.

I intend to continue living/working in my current sameby for a long time.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	No opinion
I have regular contact with other members of my sameby.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	No opinion

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	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	No opinion
I have equal access to employment in reindeer-herding when compared with members of the opposite sex.						
I have equal access to employment outside of reindeer herding activities when compared with members of the opposite sex.						

2. What is your age?
   - ☐ 18-34
   - ☐ 35-44
   - ☐ 45-54
   - ☐ 55-64
   - ☐ 65 and over
3. What is your gender?
   - ☐ Male ☐ Female
4. Is there another head of your household?
   - ☐ YES ☐ NO
5. If you answered "YES" to question #4, what is your relationship to that person?

   "The other head of my household is my..."
   - ☐ Spouse
   - ☐ Sibling
   - ☐ Son
   - ☐ Daughter
   - ☐ Mother
   - ☐ Father
   - ☐ Other relative
   - ☐ Friend

   ☐ Other: _____

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6. Who do you anticipate will carry on with your reindeer herding business once you retire?
   - ☐ There is no one who will carry on my business after I retire
   - ☐ Spouse
   - ☐ Male sibling
   - ☐ Female sibling
   - ☐ Son
   - ☐ Daughter
   - ☐ Mother
   - ☐ Father
   - ☐ Other relative
   - ☐ Friend

   ☐ Other: _____

Section 2: Reindeer Herding Plans

1. Do you know about Reindeer Herding Plans (RBP)?
   ☐Yes ☐No
2. Do you know about the division of grazing land and field inventory?
   ☐Yes ☐No
3. Do you know about external factors (omvärldsfaktorer)?
   ☐Yes ☐No
4. Do you know about Ren-GIS?
   ☐Yes ☐No
5. Do you know about GPS on reindeer?
   ☐Yes ☐No

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6. If you know about RBP, External factors, Ren-GIS and GPS on reindeer, but have not been using them, what is the reason? (Check the best answer)

- ☐ I have no interest in learning and using them
- ☐ I think the use of computers is too difficult to learn
- ☐ I don't believe it will improve conditions for me as reindeer herder
- ☐ I was never asked to learn and use it
- ☐ My enterprise is so small that I do not think it is worth the investment in learning and using it
- ☐ Other reason (please specify):

_____

_____

7. How often do you use Ren-GIS?

☐ Every day ☐ Every week ☐ Once a month ☐ Never

8. How do you use Ren-GIS?

- ☐ To look in
- ☐ To add data into
- ☐ To plan reindeer husbandry activities
- ☐ In consultation with other land users

9. How often do you use GPS on reindeer?

☐ Every day ☐ Every week ☐ Once a month ☐ Never

10. How do you use GPS on reindeer? (check all that apply)

- ☐ To get daily updates on reindeer positions
- ☐ In planning of reindeer husbandry activities
- ☐ In RenGIS to plan reindeer husbandry activities
- ☐ In RenGIS in consultation with other land users

Thank-you for taking the time to fill out our questionnaire!

Please send your completed questionnaire to:

Hanna Vestman, c/o Lidestav, Inst f skoglig resurshushållning, SLU, 901 83 Umeå

Appendix B – Interview Questions

The Influence of Gender on Adaptive Capacity:

A case study from a Swedish reindeer herding community

Interview Questions

To participants: Before we begin, I'd like to say that there are no right or wrong answers, I want you to answer however you feel is appropriate.

Section 1A: Institutional variables contributing to adaptation

1. Do you think that voting in local, regional and national elections will benefit you in some way? Why or why not?
2. Do you think that voting in Sami Parliament elections will benefit you in some way in some way? Why or why not?
3. How have the new European Union regulations impacted reindeer herding?
4. How do you think current legislation impacts your success as a reindeer herder? (Examples: Environmental Code, Forestry Act, Reindeer Husbandry Act, Predator legislation, etc.)
5. How has legislation changed over the last few decades when it comes to reindeer herding? How has this impacted reindeer herding? Positively? Negatively?
6. What would you change with regard to legislation governing reindeer herding activities?
7. Do you participate in reindeer herding plans? Why or why not? How do you think they benefit reindeer herding communities?

Section 1B: Economic variables contributing to adaptation

1. According to my data, in many Sami households, adults participate in more than one form of employment throughout the year. Can you explain why this is?
2. When it comes to daily tasks involved in reindeer husbandry, what are some things that men do more often than women? What are some tasks that women do more often than men?
3. Since the mid-1980s, has it become easier or more difficult to make money from reindeer husbandry? Why?
4. The general results of our survey indicate that most reindeer herders use modern technologies daily in their herding activities (snowmobiles, ATVs, motorcycles, etc.). Many have indicated that these technologies are essential, but expensive. What makes them so

essential that they warrant the expense? Why can't traditional technologies be used to cut costs?

Section 1C: Natural variables contributing to adaptation

1. Has the availability of natural foods changed since 1986, to your knowledge? If so, how?

   What do you think is the cause of these changes?

2. Have there been local changes in climate since 1986, to your knowledge? What kinds of changes?

   What do you think is the cause of these changes?

3. Do you find changes in the availability of natural foods for your reindeer or changes in climate concerning?

4. When compared to the mid-1980s, are there more or less losses of reindeer due to predators? Why do you think that is?

5. When compared to the mid-1980s, are there more or less losses of reindeer due to traffic accidents? Why do you think that is?

Section 1D: Human variables contributing to adaptation

1. To your knowledge, how do education levels vary between men and women?

2. Are men or women more likely to take classes on aspects of Sami culture such as Sami language and handicrafts?

Section 1E: Cultural variables contributing to adaptive capacity

1. How do you feel your ability to speak multiple languages affects the success of your reindeer herding business? Do you wish you could speak more languages?

2. Are you worried that Sami languages might die? Why or why not?

3. Do you think that either men or women tend to learn more languages than the other gender? Why do you think that is?

Section 1F: Social variables contributing to adaptation

1. According to Sami Parliament statistics, 85% of active reindeer herders are men. Why do you think that is?

2. In general, it seems that reindeer herding businesses tend to be passed down to sons more often than daughters. Can you explain why that is?

3. In a reindeer herding household, can you explain the key tasks women do that help to maintain the family lifestyle or way of life? Can you explain the key tasks men do to help maintain the family lifestyle or way of life?

4. Have the roles that the men and women played in your household changed over time? If yes, what accounts for that? Are there pressures to change?

5. Do you have a lot of opportunities to get together with other members of your community? Events, etc?

6. Do you feel that your culture and way of life are respected within greater Swedish society? Why or why not?

Additional Questions

1. What does adaptive capacity mean to you?

2. For the purposes of this study, adaptive capacity has been defined as the ability of a system to continually develop and alter itself in the face of change without sacrificing its most important functions, thereby enhancing its resilience. Do you agree or disagree with this definition? Would you add anything to this definition? Remove anything?

3. Can you think of any ways in which adaptive capacity is different or unique in a reindeer herding community relative to other communities?

4. Can you think of any examples of adaptation in your community?

5. If you considered adaptive capacity on a continuum from low to high, where would you place the adaptive capacity of your community? Please explain your choice.

6. How do men and women contribute differently to adaptive capacity? What do men contribute? What do women contribute?

Appendix C – Age & Gender

Table C1: Cross-tabulation of age by gender

			What is your age?		
			18-34	35-44	45-54
What is your gender?	Male	Count	12	15	17
		% within What is your gender?	20.3%	25.4%	28.8%
	Female	Count	9	4	4
		% within What is your gender?	42.9%	19.0%	19.0%
Total		Count	21	19	21
		% within What is your gender?	26.3%	23.8%	26.3%

			What is your age?		
			55-64	65+	Totals
What is your gender?	Male	Count	13	2	59
		% within What is your gender?	22.0%	3.4%	100.0%
	Female	Count	1	3	21
		% within What is your gender?	4.8%	14.3%	100.0%
Total		Count	14	5	80
		% within What is your gender?	17.5%	6.3%	100.0%

Appendix D –Social Cohesion Variables by Gender

Table D1: Cross-tabulation of intent to remain in current community by gender

			"I intend to continue living/working in my current sameby for a long time"	
			Agree	Strongly agree
What is your gender?	Male	Count	8	41
		% within What is your gender?	13.8%	70.7%
	Female	Count	3	14
		% within What is your gender?	15.0%	70.0%
Total		Count	11	55
		% within What is your gender?	14.1%	70.5%

Table D2: Cross-tabulation of contact with members of the community by gender

			"I have regular contact with the other members of my sameby"	
			Agree	Strongly agree
What is your gender?	Male	Count	8	45
		% within What is your gender?	13.8%	77.6%
	Female	Count	4	15
		% within What is your gender?	20.0%	75%
Total		Count	12	60
		% within What is your gender?	15.4%	76.9%

Appendix E – Access to Employment Types by Gender

Table E1: Cross-tabulation of equality of access to herding employment by gender

			"I have equal access to reindeer herding employment as opposite sex"	
			Agree	Strongly agree
What is your gender?	Male	Count	7	37
		% within What is your gender?	12.3%	64.9%
	Female	Count	4	12
		% within What is your gender?	20.0%	60.0%
Total		Count	11	49
		% within What is your gender?	14.3%	63.6%

Table E2: Cross-tabulation of equality of access to other forms of employment by gender

			"I have equal access to other forms of employment as members of opposite sex"	
			Agree	Strongly agree
What is your gender?	Male	Count	9	27
		% within What is your gender?	16.4%	49.1%
	Female	Count	5	11
		% within What is your gender?	27.8%	61.1%
Total		Count	14	38
		% within What is your gender?	19.2%	52.1%

Appendix F – Anticipated Inheritors

Table F1: Anticipated inheritors of participants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Son	6	30.0	30.0	30.0
	Daughter	1	5.0	5.0	35.0
	No one	1	5.0	5.0	40.0
	Both son and daughter	9	45.0	45.0	85.0
	Multiple relatives	3	15.0	15.0	100.0
	Total	20	100.0	100.0	

Appendix G – Participation in Teaching/Training by Age and Gender

Table G1: Cross-tabulation participation in teaching and training by gender

			"I take part in teaching and training others"		
			No	Yes	Total
What is your gender?	Male	Count	10	25	35
		% within What is your gender?	28.6%	71.4%	100.0%
	Female	Count	4	8	12
		% within What is your gender?	33.3%	66.7%	100.0%
Total		Count	14	33	47
		% within What is your gender?	29.8%	70.2%	100.0%

Table G2: Cross-tabulation of participation in teaching and training by age

			"I am involved in teaching and training others"		
			No	Yes	Total
What is your age?	18-34	Count	12	9	21
		% within What is your age?	57.1%	42.9%	100.0%
	35-44	Count	9	10	19
		% within What is your age?	47.4%	52.6%	100.0%
	45-54	Count	15	6	21
		% within What is your age?	71.4%	28.6%	100.0%
	55-64	Count	8	6	14
		% within What is your age?	57.1%	42.9%	100.0%
	65+	Count	3	2	5
		% within What is your age?	60.0%	40.0%	100.0%
Total		Count	47	33	80
		% within What is your age?	58.8%	41.3%	100.0%

Appendix H – Education Levels by Age

Table H1: Cross-tabulation of education level by age

			What is the highest level of education you have completed?					
			Elementary	Secondary	Courses in uni/college	Bachelor	Master	Total
Age	18-34	Count	1	11	5	3	1	21
		% within age	4.8%	52.4%	23.8%	14.3%	4.8%	100.0%
	35-44	Count	2	11	4	0	2	19
		% within age	10.5%	57.9%	21.1%	0.0%	10.5%	100.0%
	45-54	Count	6	12	3	0	0	21
		% within age	28.6%	57.1%	14.3%	0.0%	0.0%	100.0%
	55-64	Count	8	3	3	0	0	14
		% within age	57.1%	21.4%	21.4%	0.0%	0.0%	100.0%
	65+	Count	2	2	1	0	0	5
		% within age	40.0%	40.0%	20.0%	0.0%	0.0%	100.0%
Total		Count	19	39	16	3	3	80
		% within age	23.8%	48.8%	20.0%	3.8%	3.8%	100.0%

Appendix I – Education Barriers by Gender

Table I1: Cross-tabulation of education barriers by gender

			Do you believe you might face barriers to attaining a higher level of education?		
			No	Yes	Total
What is your gender?	Male	Count	43	16	59
		% within gender	72.9%	27.1%	100.0%
	Female	Count	19	3	22
		% within gender	86.4%	13.6%	100.0%
Total		Count	62	19	81
		% within gender	76.5%	23.5%	100.0%

Appendix J – Language Proficiency

Table J1: Descriptive statistics of participants' language proficiency

Language proficiency score

N	Valid	81
	Missing	0
Mean		7.53
Median		7.00
Std. Deviation		2.637
Range		12
Minimum		2
Maximum		14

Table J2: Language proficiency by gender

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Language proficiency score	Male	59	7.02	2.610	.340
	Female	22	8.91	2.223	.474

Appendix K – Voting Behaviour and Gender

Table K1: Cross-tabulations of voting behaviour by gender

Change in Voting since 1986 by gender

			Change in Voting since 1986				
			Vote less often	No change	Vote more often	Not applicable	Total
Gender	Male	Count	1	50	3	5	59
		% within gender	1.7%	84.7%	5.1%	8.5%	100.0%
	Female	Count	0	15	2	4	21
		% within gender	0.0%	71.4%	9.5%	19.0%	100.0%
Total		Count	1	65	5	9	80
		% within gender	1.3%	81.3%	6.3%	11.3%	100.0%

Voting behaviour in government elections by gender

			Voting behaviour in government elections					
			Never vote	Almost never vote	Vote sometimes	Usually vote	Always Vote	Total
Gender	Male	Count	6	4	7	12	30	59
		% within gender	10.2%	6.8%	11.9%	20.3%	50.8%	100.0%
	Female	Count	2	1	2	6	11	22
		% within gender	9.1%	4.5%	9.1%	27.3%	50.0%	100.0%
Total		Count	8	5	9	18	41	81
		% within gender	9.9%	6.2%	11.1%	22.2%	50.6%	100.0%

Voting behaviour in Sami elections by gender

			Voting behaviour in Sami elections					
			Never vote	Almost never vote	Vote sometimes	Usually vote	Always vote	Total
Gender	Male	Count	10	2	2	12	32	58
		% within gender	17.2%	3.4%	3.4%	20.7%	55.2%	100.0%
	Female	Count	4	0	3	1	12	20
		% within gender	20.0%	0.0%	15.0%	5.0%	60.0%	100.0%
Total		Count	14	2	5	13	44	78
		% within gender	17.9%	2.6%	6.4%	16.7%	56.4%	100.0%

Appendix L – Awareness & Adequacy of Legislation by Gender

Table L1: Awareness and feelings of adequacy regarding legislation by gender

Awareness of legislation governing reindeer herding by gender

			Awareness of legislation governing reindeer herding		
			No	Yes	Total
Gender	Male	Count	9	49	58
		% within gender	15.5%	84.5%	100.0%
	Female	Count	7	15	22
		% within gender	31.8%	68.2%	100.0%
Total		Count	16	64	80
		% within gender	20.0%	80.0%	100.0%

Feelings of adequacy toward legislation governing reindeer herding by gender

			Feelings of adequacy toward legislation governing RH				
			Very inadequate	Somewhat inadequate	Neutral	Somewhat adequate	Total
Gender	Male	Count	23	6	6	4	39
		% within gender	59.0%	15.4%	15.4%	10.3%	100.0%
	Female	Count	6	2	3	2	13
		% within gender	46.2%	15.4%	23.1%	15.4%	100.0%
Total		Count	29	8	9	6	52
		% within gender	55.8%	15.4%	17.3%	11.5%	100.0%

Appendix M – Availability of Reindeer Food in the last year

Table M1: Availability of natural foods for reindeer in the last year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very low	4	4.9	5.1	5.1
	Low	25	30.9	32.1	37.2
	Same as always	32	39.5	41.0	78.2
	Better	14	17.3	17.9	96.2
	Much better	3	3.7	3.8	100.0
	Total	78	96.3	100.0	
Missing	System	3	3.7		
Total		81	100.0		

Table M2: Supplementation of food to reindeer in the last year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	9	11.1	11.4	11.4
	Often	17	21.0	21.5	32.9
	Sometimes	12	14.8	15.2	48.1
	Almost never	21	25.9	26.6	74.7
	Never	20	24.7	25.3	100.0
	Total	79	97.5	100.0	
Missing	System	2	2.5		
Total		81	100.0		

Table M3: Reasons for supplementation of food in the last year

		Responses		Percent of Cases
		N	Percent	
Reasons for feeding reindeer last year	I supplement food during periods of famine	24	22.2%	37.5%
	I supplement food during reindeer migration	44	40.7%	68.8%
	I supplement food to fatten the reindeer before slaughter	11	10.2%	17.2%
	I supplement food to render the meat suitable for human consumption	6	5.6%	9.4%
	I supplement food for another reason	23	21.3%	35.9%
Total		108	100.0%	168.8%

Appendix N – Availability of Reindeer Food in 1986

Table N1: Availability of natural foods for reindeer in 1986

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low	2	2.5	2.5	2.5
	Same as always	9	11.1	11.4	13.9
	Better	18	22.2	22.8	36.7
	Much better	12	14.8	15.2	51.9
	Not applicable	38	46.9	48.1	100.0
	Total	79	97.5	100.0	
Missing	System	2	2.5		
Total		81	100.0		

Table N2: Supplementation of food for reindeer in 1986

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Often	2	2.5	2.6	2.6
	Sometimes	11	13.6	14.5	17.1
	Almost never	9	11.1	11.8	28.9
	Never	15	18.5	19.7	48.7
	Not applicable	39	48.1	51.3	100.0
	Total	76	93.8	100.0	
Missing	System	5	6.2		
Total		81	100.0		

Table N3: Reasons for supplementation of food in 1986

		Responses		Percent of Cases
		N	Percent	
Reasons for feeding reindeer 1986[a]	I supplement food during periods of famine	10	27.0%	37.0%
	I supplement food during reindeer migration	16	43.2%	59.3%
	I supplement food to fatten the reindeer before slaughter	3	8.1%	11.1%
	I supplement food to render the meat suitable for human consumption	2	5.4%	7.4%
	I supplement food for another reason	6	16.2%	22.2%
Total		37	100.0%	137.0%

Appendix O – Household Income Derived from Reindeer Herding

Table O1: Percentage of household income derived from reindeer herding in the last year by gender

			Percentage of household income derived from reindeer herding in the last year				
			25% or less	26% - 50%	51% - 75%	76% - 100%	Total
What is your gender?	Male	Count	15	15	16	12	58
		% gender	25.9%	25.9%	27.6%	20.7%	100.0%
	Female	Count	8	6	4	3	21
		% within gender	38.1%	28.6%	19.0%	14.3%	100.0%
Total		Count	23	21	20	15	79
		% within gender	29.1%	26.6%	25.3%	19.0%	100.0%

Table O2: Percentage of household income derived from reindeer herding in 1986 by gender

			Percentage of household income derived from reindeer herding in 1986					
			25% or less	26% - 50%	51% - 75%	76% - 100%	Not applicable	Total
What is your gender?	Male	Count	2	1	6	10	34	53
		% within gender	3.8%	1.9%	11.3%	18.9%	64.2%	100.0%
	Female	Count	0	0	0	4	15	19
		% within gender	0.0%	0.0%	0.0%	21.1%	78.9%	100.0%
Total		Count	2	1	6	14	49	72
		% within gender	2.8%	1.4%	8.3%	19.4%	68.1%	100.0%